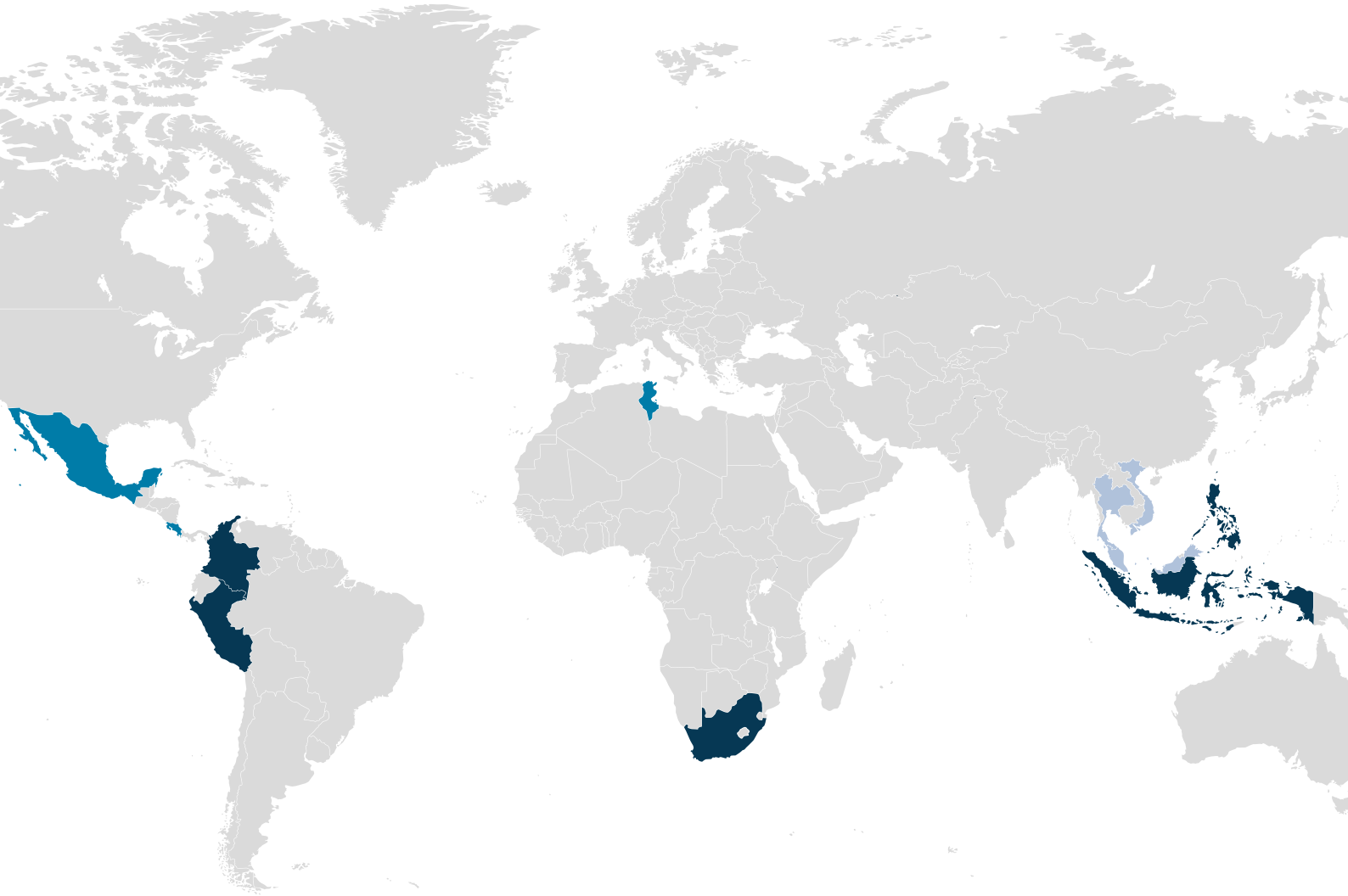


# Navigating Transport NAMAs

A practical handbook on Nationally Appropriate Mitigation Actions (NAMAs) in the transport sector

2nd revised edition

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

## Disclaimer



## Acknowledgement

This publication was designed to become a 'living document' aiming to reflect the latest state of play. The development of this handbook was a collaborative process which benefited from various expert reviews. We would like to thank all reviewers for their valuable feedback and contributions, especially: Sudhir Sharma, Subash Dhar (UNEP DTU Partnership), Charles Kooshian (CCAP), Urda Eichhorst (WI), Stefan Bakker (GIZ), Daniel Bongardt (GIZ), Manfred Breithaupt (GIZ), Lachlan Cameron (ECN), Frauke Röser (Ecofys), Armin Wagner (GIZ), Cornie Huizenga (SloCat), Carlos Felipe Pardo (Despacio), Ko Sakamoto (ADB), Henri Chua (IM Technologies Unlimited), James Vener (UNDP), Benoit Lefevre (WRI), Lachlan Cameron (ECN), Frederic Rudolph (WI), Florian Mersmann (WI) and Daniel Sutter (INFRAS).

For information, questions or comments regarding this publication, please contact Ms. Andrea Henkel or Mr. André Eckermann (transfer@giz.de)

# Contents

# Background Information on the TRANSfer Project

The handbook was prepared by the TRANSfer Project. The TRANSfer project is run by GIZ and funded by the International Climate Initiative of the German Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). Its objective is to support developing countries to develop and implement climate change mitigation strategies in the transport sector as „Nationally Appropriate Mitigation Actions“ (NAMAs).

The project follows a multi-level approach:

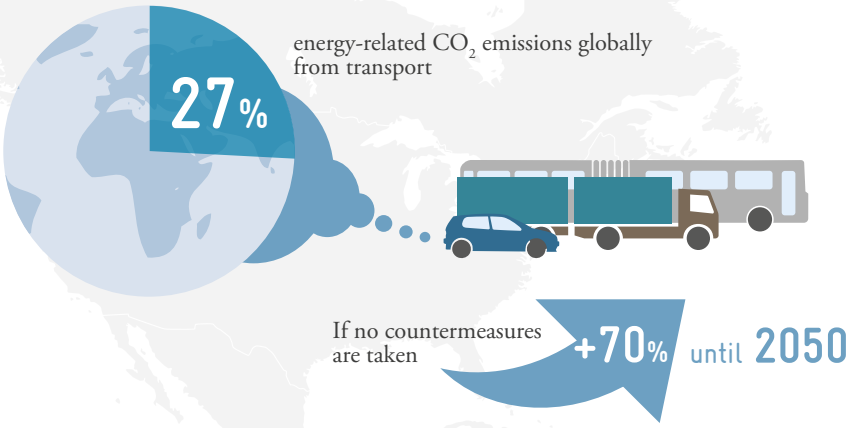
- At country level, TRANSfer supports selected partner countries in developing and implementing NAMAs in the transport sector. The NAMAs supported by the project cover a broad variety of approaches in the partner countries Indonesia, South Africa, Philippines, Peru and Colombia.
- At international level and closely linked to the UNFCCC process, the project helps accelerate the learning process on transport NAMAs with a comprehensive set of measures (events, trainings, facilitation of expert groups, documents with guidance and lessons learned such as the transport NAMA handbook and a database).

Activities at country and international level are closely linked and designed in a mutually beneficial way. While specific country experience is brought to the international stage (bottom-up) to facilitate appropriate consideration of transport sector specifics in the climate change regime, recent developments in the climate change discussions are fed into the work in the partner countries (top-down).

For more information see: www.transport-namas.org

# Foreword

Transport systems do not automatically develop into sustainable low-carbon pathways. Rising prosperity and economic growth typically lead to a significant increase in transport demand and motorisation, along with the associated traffic congestion and noise, local air pollution, regional and global environmental impacts, high energy demand and traffic accidents. The health effects of toxic vehicle emissions are additionally compounded as urban populations are expected to rise. As estimated by Replogle and Fulton (2014) the number of premature mortalities caused by air pollution worldwide could roughly quadruple by 2050: "Emission standards requiring vehicle technology and fuels equivalent to Euro 6/VI or better could prevent an estimated 1.36 million premature deaths annually – equivalent to 19 million years of life lost – in 2050."




In 2011, transport was responsible for 27% of global fossil-fuel-related carbon dioxide emissions, the second largest polluting sector (IEA, 2012). More than 80% of the sector's emissions growth over the last four decades came from road transport, mainly passenger light-duty vehicles, and are projected to almost double by 2050 (IEA, 2013). Most of this increase is projected to happen in the developing world, stemming from a large increase in freight transport and the rapidly growing number of passenger cars, coupled with declining shares of the more efficient modes of rail, public and non-motorised transport.

Transport is the end-use sector that has seen – by far – the most rapid increase in emissions over the last twenty years. $CO_2$ emissions in the sector increased by 2.2 Gt $CO_2$ from 1991 to 2011 – or by almost 50%. Reducing transport emissions thus forms a crucial element for any comprehensive strategy to reduce global $CO_2$ emissions. Quoting Yvo de Boer, the former executive secretary of the UNFCCC, "If you do not tackle transport, you cannot tackle climate change."[1]

Road transport accounts for about three-quarters of global transport emissions and a diverse set of mitigation measures will be required in this sub-sector. Up to 2020 the most effective means of abatement will be lower vehicle usage, fuel efficiency gains and an increase in the use of alternative fuels. Over the longer term, improvements in vehicle fuel economy represent the most important abatement measures, accounting for 51% of cumulative savings in the transport sector from 2011 to 2035 as projected by the International Energy Agency (IEA, 2012).

A transition towards sustainable low-carbon transport systems requires a shift in current policy making and investment decisions. This requires substantive capacity building for policy design and planning in order to stimulate sectoral transformation. The good news is that a number of sustainable low-carbon transport solutions are available and have proven effectiveness worldwide.

Nationally Appropriate Mitigation Actions (NAMAs) provide the opportunity for ambitious greenhouse gas reduction activities in developing countries under the United Nations Framework Convention on Climate Change (UNFCCC). It may also open up opportunities to boost domestic support as well as for bilateral and multilateral cooperation in terms of technology, finance and capacity development. A NAMA is considered to be any mitigation action tailored to the national context, characteristics and capabilities, and embedded in national sustainable development priorities. In order to achieve the goal of keeping the global temperature increase below 2°C, Nationally Appropriate Mitigation Actions (NAMAs) are a good opportunity for developing countries to reduce emissions significantly from Business-As-Usual (BAU) scenarios. Many countries are already taking steps to use NAMAs as instruments for participating in the global mitigation agenda and as a means of leveraging national and international support for more effective and transformational climate actions.

[1] Yvo de Boer, previous Executive Secretary of the UNFCCC.

NAMAs are a very promising instrument to gain international support and/or recognition for the transport sector. NAMAs in the transport sector not only contribute to reduced greenhouse gas (GHG) emissions – they also provide further benefits to the economy, society and the (local) environment. The implementation of transport NAMAs has the potential to combine climate change mitigation with economic growth, poverty eradication and improved quality of life.

The UNFCCC Secretariat supports intergovernmental climate change negotiations as well as an increasing number of constituted bodies that serve the process. In order to facilitate matching of capacity-building, technology transfer and financial support for their implementation, the Parties to the UNFCCC have established a registry to help other countries learn from previous NAMA experiences, which may help boost the adoption of successful measures. The registry already includes a large number of NAMAs. The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) is supporting the development and implementation of NAMAs and respective learning and knowledge sharing through the International Climate Initiative (IKI). The GIZ TRANSfer project, funded by BMUB, aims to support NAMA development in the transport sector around the globe and to contribute to international transport related learning.

The purpose of this handbook is to provide transport policy-makers around the globe with practical guidance on steps to identify, design, implement and monitor mitigation actions in the transport sector that are nationally appropriate.

**Christiana Figueres**
UNFCCC Executive Secretary

**Dr. Barbara Hendricks**
German Federal Minister for the Environment, Nature Conservation, Building and Nuclear Safety

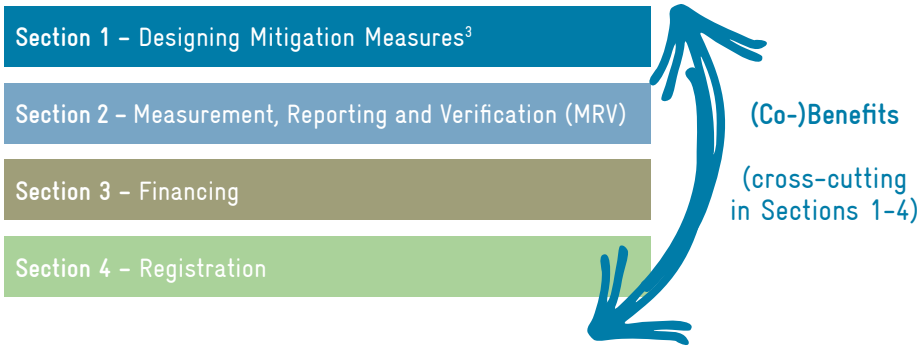
# How to use this handbook

## About this Handbook

This handbook provides conceptual background information and practical guidance on transport NAMAs. Its objective is to facilitate the preparation and implementation of Nationally Appropriate Mitigation Actions (NAMAs) in the transport sector to increase the sector's contribution to mitigate climate change. The handbook was developed over a period of several years in an iterative, participatory process closely linked to a broad range of activities of the GIZ TRANSfer Project, including a broad review process with a large group of NAMA practitioners. It presents practical experience with transport NAMAs, including GIZ's vast field experience in a concentrated and action oriented way, in order to support and stimulate the development of further transport NAMAs. The handbook is complementary to the UNFCCC NAMA Guidebook[2], which gives more general guidance on NAMAs without a particular sectoral focus, while this handbook elaborates further on transport sector specific issues. The focus of this handbook is on NAMA preparation. Some additional information is given on the implementation of NAMAs.

## The logic behind the Handbook

The handbook is based on the experience that every NAMA development is a genuine process. Since the conditions for developing a NAMA differs from country to country, every NAMA is tailor-made. Nevertheless, based on international experience, the ingredients for a NAMA are quite uniform. The following four elements form the main building blocks of any NAMA in the transport sector.




Decision makers aiming to design transport NAMAs can use these five elements as an orientation to "what is needed to design a transport NAMA". It is important to note that these elements are connected and influence each other, i.e. a NAMA preparation is not a routine process that starts with one of these elements and moves in a fixed sequence through the others. To the contrary, sound NAMA development is driven by the principle of "national appropriateness." This is why every NAMA development process is different. It depends on the specific circumstances: on available information and resources, whether a NAMA focuses on a new field for the country (Green Field NAMA), whether the NAMA is intended mainly for international recognition of an ongoing initiative in the country (NAMA Label) or is aiming to up-scale an existing measure (up-scaling NAMA). Many other factors influence the process. In the end, any NAMA needs to be tailored to the specific circumstances, and the success of any NAMA development process depends to a large extent on putting the "pieces of the puzzle" together in an efficient and targeted manner.

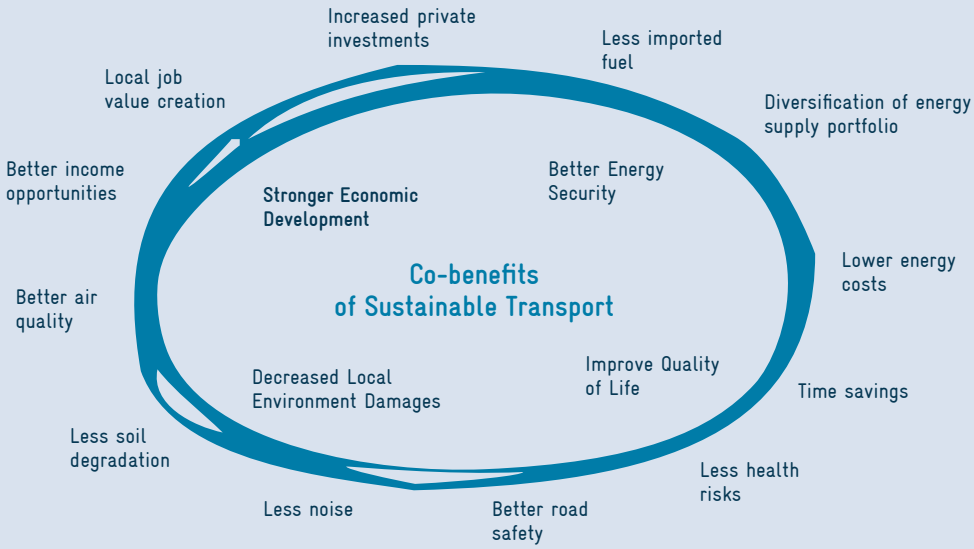
[2] Available at www.namapipeline.org/Publications/Guidance_for_NAMA_Design_2013_.pdf
[3] The term "policy" covers strategy, policy, programme, project as well as combinations and packages of these. In general terms, we refer to these as measures.

**Box 1:**

**Sustainable development benefits/Co-benefits:**

The natural focus of those in the transport sector usually lies on air quality and associated health costs, lost time due to traffic congestion, reduction of noise, accidents and corresponding fatalities. While these benefits are the main driving force from a transport perspective to develop and implement a sustainable transport measure, those with a climate change perspective consider these as sustainable development benefits or so called co-benefits, i.e. additional benefits on top of the primary benefit of greenhouse gas mitigation. Since these benefits normally represent the main driving force for those in transport, they are considered in every chapter of this handbook as an important symbiotic issue.

Publication on „Sustainable Development Benefits" available at http://transport-namas.org/resources/publications/




**Content covered in this handbook**

This handbook provides practical guidance for each of the main building blocks, which can be summarised as follows:

**Section 1: Designing Mitigation Measures**

Section 1 gives an overview of options for possible mitigation measures in the transport sector and illustrates the process of how to identify, set priorities and further specify these measures for a particular transport NAMA.

**Section 2: Measurement, Reporting and Verification (MRV)**

Section 2 provides more detailed information on how to measure, report and verify the climate change mitigation effect and wider sustainable development benefits of a transport NAMA.

**Section 3: Financing**

Section 3 describes how to set up an economically and financially feasible NAMA, including estimation of costs and revenues, assessment of the financial and economic viability, design of the financial structure and a fundraising strategy.

**Section 4: Registration**

Section 4 of this handbook guides users through the steps required to register a transport NAMA with the Secretariat of the United Nations Framework Convention for Climate Change (UNFCCC).

Each of the sections is structured in the same way to facilitate the practical use of the handbook:

- **Introduction and overview of tools:** Each section starts by introducing the topic to the reader and gives an overview of the main elements and relevant tools in a table.
- **More detailed description of main elements:** The main elements of each section are described in more detail, including specific guidance, practical tips, illustrations and references to examples and useful tools.
- **Checklist and tips for further reading:** Each section closes with a checklist that shows the main elements of each building block at a glance and facilitates on-the-job use of the handbook. The sections close with a list of references where additional information can be found.

The handbook is complemented by a number of practical tools. An overview of the tools is presented in the section Getting started.

Furthermore, the different sections directly refer to specific tools that are gathered in a Transport NAMA Toolbox.

All tools are available at www.transport-namas.org/resources/toolbox.

## Icons used in this handbook

The following icons are used throughout this handbook, and refer to the following:

Definition of a term

Important tip or remark

Tools

Sustainable Development Benefits

Further reading

# Glossary

**Annex I Parties to the UNFCCC**

Annex I Parties include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

Link to country list: www.unfccc.int/parties_and_observers/parties/annex_i/items/2774.php

**Non-Annex I Parties to the UNFCCC**

Non-Annex I Parties are developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures. The Convention emphasizes activities that promise to answer the special needs and concerns of these vulnerable countries, such as investment, insurance and technology transfer.

Link to country list: www.unfccc.int/parties_and_observers/parties/non_annex_i/items/2833.php

**A-S-I**

Avoid-Shift-Improve. The objective of the A-S-I approach is to promote low carbon mobility and to develop sustainable transport systems. Avoid or reduce the need to travel. Shift to or maintain the share of more environmentally friendly modes. Improve the energy efficiency of transport modes (vehicle technology and fuels).

**ASIF framework**

Activity (trips in km per mode), Structure (modal share), Intensity (energy intensity by mode in MJ/km), Fuel (carbon intensity of the fuel in kg $CO_2$/MJ) are the four different components that determine the transport sector's GHG emissions. The ASIF Framework helps to capture the characteristics of the current transport system. It can be used for emission calculation and measurement.

**Baseline emissions**

The emissions that would occur without any intervention in a business-as-usual scenario (i.e. case without a potential NAMA). Baseline estimates are needed to determine the effectiveness of emission reduction measures.

**BAU Scenario**

Business-as-usual is a phrase that aims to describe what would happen if nothing changed from the current status quo. The intention is to show the difference compared to the situation when a strategy, policy, programme or project were to be introduced. The BAU scenario serves as a reference scenario (baseline emissions), which illustrates the results of current trends often in contrast to alternative scenarios that take into account specific interventions.

**Capacity Building**

Capacity Building, also referred to as Capacity Development, is the process of strengthening the abilities of individuals, organizations and systems to make effective use of their resources in order to achieve their goals on a sustainable basis.

**Co-Benefits**

Official documents of the UNFCCC distinguish between 'GHG benefits' and 'co-benefits'. Co-benefits are intended or unintended positive side-effects of a mitigation measure. There are synergies with other objectives, such as air quality, productivity, road safety etc. associated with greenhouse gas emission reductions. This handbook refers to them as 'benefits'.

**IPCC**

The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. In the same year, the UN General Assembly endorsed the action by WMO and UNEP in jointly establishing the IPCC.

**Measures**

In this handbook used as the overarching term for sustainable transport measures, which may be a strategy, policy, programme or project.

**Mitigation Action**

A measure or package of measures (e.g. strategies, policies, programmes or projects) that helps reducing greenhouse gas emissions.

**MRV/MRV-able**

"Measurement", "Reporting" and "Verifying" are important aspects of turning for example a policy, programme or project into a NAMA.

- Measurement: collect relevant information on progress and impacts
- Reporting: present the measured information in a transparent and standardised manner
- Verification: assess the completeness, consistency and reliability of the reported information through an independent process.

**National Reporting**

Parties to the United Nations Framework Convention on Climate Change (UNFCCC) must submit national reports on implementation of the Convention to the Conference of the Parties (COP). Furthermore, it is a formal requirement to report on planned, current and implemented NAMAs within biennial update reports (BURs).

**National Communications**

The core elements of the national communications for both Annex I and non-Annex I Parties are information on emissions and removals of greenhouse gases (GHGs), and details of the activities a Party has undertaken to implement the United Nations Framework Convention on Climate Change (UNFCCC). National communications usually contain information on national circumstances, vulnerability assessment, financial resources and transfer of technology, and education, training and public awareness.

**National Focal Point**

A person and the respective Ministry/Organisation responsible for country communications to UNFCCC

**Registration**

The Parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to establish a registry to record Nationally Appropriate Mitigation Actions (NAMAs) and to facilitate matching of capacity-building, technology transfer and financial support for their implementation. The registry helps other countries to learn from previous experience, which may boost the adoption of successful measures. It contains a brief description of the registry, including its sections and functions, and presents an overview of the information on NAMAs and support to be submitted by the National Focal Points or representatives from other stakeholders.

**UNFCCC**

The United Nations Framework Convention on Climate Change entered into force on 21 March 1994. Today, it has near-universal membership. The 195 countries that have ratified the Convention are called Parties to the Convention.

The UNFCCC is a "Rio Convention", one of three adopted at the "Rio Earth Summit" in 1992.

**Unilateral and supported NAMAs (Domestically-supported and internationally-supported NAMAs)**

Unilateral NAMAs are exclusively domestically financed voluntary mitigation actions as opposed to bilaterally or internationally supported NAMAs which contain both domestic and international financing elements. MRV is at the discretion of the respective countries. Guidelines are expected to be developed under the climate convention. In the case of supported NAMAs, MRV is expected to be conducted domestically, but with international oversight and subject to international MRV procedures. International MRV can be mandated by donors/investors. Financial and technical support is expected to be recorded as well.

# Navigating the NAMA Landscape

**Green Climate Fund (GCF)**

GCF was established by 194 governments to limit or reduce greenhouse gas (GHG) emissions in developing countries and to help vulnerable societies adapt to the unavoidable impacts of climate change. The fund is a unique global platform to respond to climate change by investing in low-emission and climate-resilient development. GCF is accountable to the United Nations. It is guided by the principles and provisions of the UN Framework Convention on Climate Change (UNFCCC). It is governed by a board of 24 members, comprising an equal number of members from developing and developed countries.

www.greenclimate.fund/home

**Global Environment Facility (GEF)**

The Global Environment Facility (GEF) was established at the 1992 Rio Earth Summit, to help tackle pressing environmental problems worldwide. Since then, the GEF has provided over $14 billion in grants and mobilized in excess of $70 billion in additional financing for more than 4,000 projects. The GEF has become an international partnership of 183 countries, international institutions, civil society organizations, and private sector to address global environmental issues.

www.thegef.org/gef/

**International Climate Initiative (IKI)**

The International Climate Initiative, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) finances national climate change mitigation projects. BMUB created the National Climate Initiative in 2008 to support projects in Germany that contribute to the successful transformation of Germany's energy system, while harnessing existing potentials for cost-effectively reducing emissions. Several IKI projects support NAMA development and implementation such as TRANSfer, the Mexican-German NAMA programme and the main dialogue.

www.international-climate-initiative.com/en/about-the-iki/

**LEDS Global Partnership**

LEDS is a partnership founded to use coordination, information exchange and cooperation between programmes and countries to advance climate-resilient low emission development. It was launched in 2011, has 113 members, and it is a comprised of a number of work streams that include a Transport Working Group, which is led by WRI/EMBARQ in partnership with UNEP and NREL (the USA's National Renewable Energy Laboratory). This Working Group capitalises upon its broad membership to support the realisation of common goals by encouraging exchange of, and engagement with, diverse perspectives, fostering open peer to peer learning and exchange, including sharing and collaborating on development of methods and tools and on innovative approaches being considered and adopted.

www.ledsgp.org/home

**NAMA Database**

Ecofys has developed a database that contains information about NAMA activities that are taking place economy-wide. It contains details of NAMA proposals and feasibility studies that have been published and that indicate specific actions which are either supported or have specified a clear finance, technology or capacity building need. Its aim is to share information about NAMA activities, enabling countries to learn from these experiences and gain insights into how mitigation activities can be undertaken within the NAMA framework.

www.nama-database.org/

**NAMA Facility**

The NAMA Facility was launched by the UK Department of Energy and Climate Change (DECC) and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMUB) in December 2012. It was established to support developing countries that show leadership on tackling climate change and that are willing to implement ambitious climate protection measures.

www.gov.uk/government/publications/information-about-the-nationally-appropriate-mitigation-actions-nama-facility

**NAMA News**

NAMA News is hosted by the United Nations Framework Convention on Climate Change (UNFCCC). The website shares stories about the development and implementation of NAMAs around the world and provides information on international support mechanisms, the NAMA registry, publications, training opportunities and events.

http://namanews.org/news/

**NAMA Partnership**

The NAMA Partnership is an example of a recent initiative that was created in recognition of both, the demand from developing countries for support with preparing and implementing NAMAs and the uncoordinated nature of support that is available. Launched at COP18 in Doha (Qatar), it is an international partnership of multilateral organisations, bilateral cooperation agencies and think tanks co-ordinated by the UNFCCC Secretariat. The partnership is working on NAMAs to enhance collaboration and make use of synergies of activities that the different organisations are involved in, identify best practices, and facilitate the preparation and implementation of NAMAs in developing countries.

www.namapartnership.org/

**NAMA Pipeline**

UNEP Risø Centre has developed a NAMA pipeline which provides an informal overview of activities submitted to the UNFCCC as NAMAs. The NAMA pipeline contains details of all communications to the UNFCCC from developing countries for Nationally Appropriate Mitigation Actions, even where these communications have not yet been formalised.

www.namapipeline.org/

**NAMA Registry**

The UNFCCC agreed to establish a NAMA Registry to record NAMAs and to "…facilitate matching of finance, technology and capacity building support for their implementation." At COP 17 (2011) it was decided to develop the registry as a dynamic, web-based platform and the Secretariat was requested to develop a prototype for trial. The NAMA Registry was operationalised in October 2013, and can be used to record NAMAs for recognition, NAMAs seeking international support for preparation or implementation, and support that is available at www.unfccc.int/cooperation_support/nama/items/7476.php

**Partnership for Mitigation and MRV**

The International Partnership on Mitigation and MRV, which was launched to support practical exchange on mitigation related activities and MRV between developing and developed countries, supports the effective implementation of LEDS, NAMAs and MRV systems. As a partnership it brings climate experts together from a variety of countries to identify best practices, support learning between members, establish a shared mitigation related knowledge base, and disseminate lessons learnt. It has 40 members and conducts technical as well as capacity building activities seeking to co-ordinate national implementation and international negotiations.

www.mitigationpartnership.net

**Transport NAMA Database**

It is an interactive web-based portal that provides details of transport NAMAs that are in all stages from initial concept to implementation with the aim of improving knowledge management, supporting the identification of capacity building needs, the matching of financial and technical support, and the establishment of contacts and networks for the transport NAMA community. It has been developed by GIZ within the framework of the International Climate Initiative (IKI) supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and WRI/EMBARQ. The Database contains a wide range of information about each NAMA that is presented in three 'Levels'. They collectively give users an in-depth insight into the main characteristics and processes behind each transport NAMA feature, including the policy identification process, mitigation actions, co-benefits, MRV, financing and the registration process.

www.transport-namadatabase.org.

# Getting started

## What is a NAMA?

Greenhouse gas emissions from transport are projected to increase rapidly unless ambitious actions are taken to curb this trend. A large number of possible measures are readily available (see the Factsheet compilation and Overview table in the TRANSfer Toolbox) that can reduce $CO_2$ emissions and short-lived climate pollutants, while also generating sustainable development benefits, such as improved air quality and road safety, higher productivity and energy efficiency. There are a multitude of reasons to strive towards sustainable mobility – not only for climate change mitigation.

This handbook aims to facilitate the development of ready-to-implement measures to mitigate greenhouse gas emissions in the transport sector as NAMAs. These NAMAs might be funded purely domestically or receive international support. Support might be provided for preparation and/or implementation and can be provided as capacity building, technological and/or financial support.

Jakarta, Indonesia; Photocredit: Daniel Bongardt/2010

NAMAs are voluntary measures taken by developing countries that are reported by national governments to the United Nations Framework Convention on Climate Change (UNFCCC). The concept of NAMAs was introduced in the Bali Action Plan (2007) and is seen as a useful instrument for mitigation action in developing countries under the UNFCCC.

## Why develop a NAMA?

You might be wondering what the difference is between a "traditional" sustainable transport measure and a transport NAMA and why you should go for a NAMA? In fact, the same measure or combination of measures could be dealt with as a NAMA or not. However, there are some differences:

- NAMAs need to have a MRV concept;
- developing a sustainable transport measure as a NAMA may allow accessing climate finance;
- the stakeholder setting tends to be different (involvement of Ministries of Environment in many cases).

Treating the sustainable transport measures as a NAMA offers several benefits, amongst others:

- international recognition for the mitigation action(s); as well in the negotiations in the UNFCCC context;
- access to support (capacity building, technology transfer, financial support);
- improved management of sustainable transport measures through dedicated monitoring and reporting (and eventually verification).

## How to prepare a NAMA?

As mentioned above, the process of developing a NAMA is like a puzzle. The main sections of the handbook describe the individual puzzle pieces in more detail. Table I-1 gives an overview of:

- **main elements** in NAMA development (Design of mitigation measures, MRV, Financing, Registration)
- **main phases** of a NAMA cycle (from Scoping, Design, Appraisal to Implementation and Monitoring & Evaluation)
- **tools** that might help to perform a certain step in the NAMA development process.

The particular process and content addressed while developing a NAMA can vary widely, depending on the particular circumstances. In general, the level of detail and information as well as data and resources required and processed increases over time and along the cycle moving from Scoping, via Design and Appraisal to Implementation and M&E.


Lima, Peru; Photocredit: Carlos F. Pardo/2013

**Box 2:**

**Why transport NAMAs?**

Sustainable transport policies often face barriers such as lack of capacity, finance, data and political momentum. An internationally supported NAMA helps addressing these barriers by:

- More effective transport strategies by means of support through experts and international experiences for policy development, planning and capacity enhancement. This helps to ensure a more comprehensive and effective transport policy package including not only large scale investments going into transport infrastructure and vehicle technologies but also many important, often low-cost, policies related to e.g. vehicle efficiency or TDM. The latter are often forgotten or not well-planned even though crucial to successful transport climate change mitigation strategies. (Example: TRANSPerú)
- Climate finance, which complements domestic finance, creating more resources for identifying, preparing and implementing measures and creating viable project pipelines; climate finance could be particularly beneficial to demonstrate successful options based on pilot projects and interventions. This creates potential for scaling up by other international financial sources and shifting domestic budgets towards sustainable transport. (Example: Clean Technology Fund programme for Vietnam[4])
- In addition, part of climate finance can be used for data gathering and monitoring / evaluation (MRV), which often is lacking in current policy practices. This could result in better initial selection and design of policies as well as feedback to policymakers and the public as to the implementation of actions, ensuring more successful implementation of the NAMA and other policies. (Example: TOD Colombia)
- Establishing a framework for enhanced and consistent actions, which will help the various policymakers and other stakeholders to discuss and implement continued sustainable transport policy actions, i.e. the NAMA enhances political momentum. International and national recognition helps building up this momentum. (Example: NAMA SUTRI)

[4] http://www-cif.climateinvestmentfunds.org/country/vietnam/vietnams-ctf-programming

Bogota, Colombia; Photocredit: Carlos F. Pardo/2006

**How to register a NAMA and where to find real world NAMA examples?**

The motivation of developing countries to register domestic measures as NAMAs under the UNFCCC may be to demonstrate their contribution to climate change mitigation, to share their experience or to seek international support, for NAMA preparation and implementation. NAMAs can be strategies, policies, programmes and projects implemented at national, regional, or local level. Developing countries may prepare and implement NAMAs in all sectors, or even cross-sectoral. Initiatives that are developed as a NAMA can build on existing, planned or new measures.

NAMA developers may register their NAMAs at www4.unfccc.int/sites/nama. This site already provides an overview of NAMAs seeking support for preparation and/or for implementation, as well as NAMAs for recognition. To enhance accessibility, the UNEP Risø Centre has developed a less formal overview of NAMA activities, downloadable here www.namapipeline.org. Another website providing an overview of a number of NAMAs is available at www.nama-database.org by Ecofys. Moreover, GIZ has developed a database providing information on transport NAMAs, which can be accessed at www.transport-namadatabase.org.

The databases aim to provide an international overview of NAMAs, and to share experience on how mitigation actions can be undertaken within the NAMA framework. In addition to these databases, there are different partnerships to facilitate international learning and sharing of experience. See for example www.mitigationpartnership.net, which includes a list of initiatives which are currently working on NAMAs or www.namapartnership.org.

**Box 3:**

**Key characteristics of NAMAs**

The UNFCCC's understanding on NAMAs can be broken down into the following elements (see also UNDP, UNFCCC, UNEP Risø, 2013):

- NAMAs are voluntary actions taken by developing countries to reduce GHG emissions.
- Their aim is to assist developing countries that wish to reduce emissions to a level below that of business-as-usual (BAU), but they do not represent a legal obligation under the UNFCCC.
- Determining which actions to take under a NAMA is each country's sovereign right, since the definition of "appropriate mitigation action" is relative to a party's particular national circumstances. In general, NAMAs are designed to support efforts towards sustainable development, as interpreted by the host country.
- Negotiations have resulted in the NAMA concept underpinning diverse approaches host countries use to identify, prepare for and implement development strategies that are sustainable and lower their GHG emission paths as well.
- NAMAs allow developing countries to address high-priority national goals such as improved transportation systems, energy security and public health, and couple these with GHG emissions reduction objectives.
- GHG emission reductions resulting from NAMAs are to be transparently measured, reported and verified. MRV requirements are not part of the definition of NAMAs, but by their nature, they must be considered throughout NAMA development and implementation.

Lima, Peru; Photocredit: Carlos F. Pardo/2013

Table I-1: NAMA Cycles

www.transport-namas.org/resources/toolbox

| NAMA cycle | | | | | |
|---|---|---|---|---|---|
| | Preparation | | | Implementation | M&E |
| **NAMA elements** | **Scoping** | **Design** | **Appraisal** | **Construction/ policy/programme implementation** | |
| **Mitigation measures** | • Identification of possible measures for a NAMA (Tools: Overview table with possible measures; Fact Sheets on possible measures)<br>• Selection of a NAMA (Tools: NAMA Screening Tool)<br>• Initial description of the NAMA (Tools: Initial NAMA Concept Note template) | • Detailed design of direct mitigation measures, supportive and organisational measures (Tools: Identification of barriers & supportive measures; specialised consultancies, Stakeholder map; NAMA coordination (steering structure)) | Decision making on resource allocation, MRV approach (including scope, frequency and responsibility for reporting) and financial structure and formalisation of commitments.<br>A fully elaborated NAMA Concept Document facilitates receiving the required funds for implementation. (Tools: Full NAMA Concept template)<br>It is quite common to pass through an iterative process adjusted design of the measures/financial structure/MRV approach in order to allow for final appraisal. | (Not part of this handbook. This handbook focusses on conceptual and practical guidance for NAMA preparation.) | |
| **MRV** | • How to define MRV objectives (Tools: Guidance for NAMA Design on MRV of NAMAs (Chapter 6))<br>• How to Set-up National MRV Systems (Tools: GIZ MRV Tool) | • Definition of cause-impact chain, system boundaries, methodology<br>• Data collection & gap analysis, core assumptions<br>• Measure NAMA impact (Tools: MRV Reference Document and MRV Blueprints; models/software tools) | | | |
| **Financing** | Barrier Analysis | • Context Analysis (Tool: Barrier Analysis)<br>• Identify costs and revenues<br>• Develop the financial structure of a project-based transport NAMA (Tools: Cost-Benefit Analysis, Sustainability Assessment, Financial Appraisal)<br>• Develop the financial structure for a strategy-, policy-, or programme-based NAMA (Tools: Expert consultancies, Financial flow chart) | | | |
| **Registration** | Registration with UNFCCC is voluntary, follows the procedure outlined on the UNFCCC NAMA registry website and can take place any time depending on the country's preferences. (Tool: UNFCCC NAMA Registry) | | | | |

increasing level of detail and required information, data and resources (over time)

# Section 1

## Designing Mitigation Measures

# 1. Designing Mitigation Measures

## Introduction

Generally speaking, any strategy, policy, programme or project that reduces greenhouse gas emissions in transport could become a NAMA. This can include a range of actions at all levels of government or in the private sector including, for example, investments in freight and public transport infrastructure at a local level or the introduction of fuel or vehicle taxation at a national level. While this might be done for a multitude of reasons, including health, safety, better access and mobility or revenue generation, what makes a transport strategy, policy, programme or project a NAMA is its contribution to greenhouse gas emission reduction.

NAMAs are an opportunity to participate in the UNFCCC process and receive recognition for mitigation activities, as well as gather international support in the form of capacity building, technology transfer and/or financial resources. The selection of a mitigation measure can follow different approaches. In some cases national governments may pursue an initiative that has high priority within national development policy, while others may systematically analyse mitigation potential of different options in the transport sector and develop a NAMA based on high mitigation potential. Experience shows that a set of multiple criteria are the most effective means to identify and select the most suitable measure (or several) to be developed into a NAMA. In any case a selection process is required, followed by a more detailed specification and design of the selected measures. This handbook suggests a multi-criteria analysis for NAMA identification and gives guidance on the specification and design of the measures.

Jakarta, Indonesia; Photocredit: Manfred Breithaupt/2013


Manila, Phillipines; Photocredit: Manfred Breithaupt/2013

Table 1-1: Main elements and useful tools

| | Elements and steps | Tools |
|---|---|---|
| Designing mitigation measures | 1.1 Identify suitable measures | • Overview table with possible measures<br>• Fact Sheets on possible measures |
| | 1.2 Select preferred measures | • NAMA Screening Tool<br>• Initial NAMA Concept Note template |
| | 1.3 Design selected measures in more detail | • Identification of barriers and supportive measures<br>• Realization of specialized consultancies<br>• Full NAMA Concept template |
| | 1.4 Involve relevant stakeholders | • Stakeholder map<br>• NAMA Coordination (Steering Structure) |

# 1.1 Identify potential measures

**Results of this step:**
**List of NAMA options**

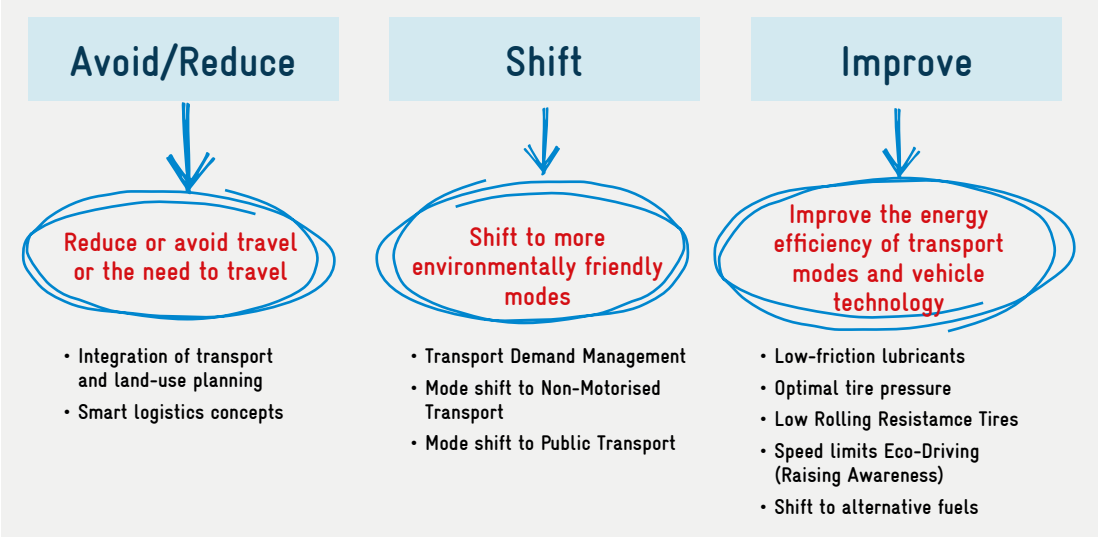
**Overview table with possible measures; Fact Sheets on possible measures**

Transport is a key enabler of economic activity and social connectedness; demand for transport of passengers and goods is increasing rapidly along with economic and population growth. Different measures to reduce emissions in the transport sector can be considered to mitigate the effects of this rising demand for mobility. In the beginning of the NAMA preparation process it is important to understand which types of strategic approaches, measures and instruments can form part of a NAMA. Once a general understanding of what constitutes a NAMA is clear, relevant stakeholders should jointly come up with a **long-list of potential NAMA measure options.** After a subsequent priority setting process, a **short-list** is usually created or just one specific NAMA option is selected for further development (see next subsection).

Mitigation measures in the transport sector can include measures to reduce or minimise and manage travel demand (Avoid), shift demand to low-carbon modes or maintain its share[5] (Shift) and/or improving vehicle technologies and fuels (Improve). This so-called **A-S-I approach** applies to passenger and freight transport and provides a useful way of classifying the spectrum of options in a systematic manner (see for a more detailed overview of possible measures **"Overview table with possible measures"** and **"Factsheets on possible measures"** in the TRANSfer Toolbox.


Palembang, Indonesia; Photocredit: Manfred Breithaupt/2013

Figure 1-1: The Avoid-Shift-Improve approach (Source: GIZ)




[5] In many countries business-as-usual (BAU) scenarios show a steep increase in the modal share of motorised vehicles. Measures that slow or stop this trend contribute to GHG mitigation since the share of less carbon intense modes is maintained instead of a more carbon intense use of private vehicles as projected under BAU.

The **types of measures** that can form a NAMA can be classified as strategies, policies, programmes or projects. It is not always possible to clearly allocate a NAMA to one of these categories, since a NAMA might cover a combination of several possible types of measures:

- **Strategies** can constitute a comprehensive NAMA that starts with a common vision and specific targets and links those to concrete polices, programmes and projects to achieve these targets.
- **Policies** that can be developed into a NAMA can be a powerful tool to shape the development of the transport sector towards a sustainable, low-carbon sector at national, regional and local levels.
- **Programmes** are a combination of projects, such as a metro, bus lines and walking and cycling infrastructure and/or operation projects such as logistics concepts that are planned and implemented in an integrated way. Mostly developed on a city level, comprehensive programmes are a vital part of a transformational change, but require a policy framework that supports this change.
- **Project-based** NAMAs are usually limited to specific infrastructure investments, such as a metro or BRT line. While well-designed projects can improve specific aspects in the targeted area, they are unlikely to initiate a transformational change in the sector as a stand-alone measure and are therefore often combined with a package of measures promoting the effectiveness and potential scaling of the specific project.

Manila, Phillipines; Photocredit: Ko Sakamoto/2013

Lima, Peru; Photocredit: Jeroen Buis/2013

Various **instruments to promote sustainable transport** at national and local government levels can be applied as part of a NAMA. The main instrument categories are summarised as follows:

- **Regulatory instruments,** such as vehicle fuel economy standards (national) or emission-related vehicle access restrictions for certain areas (local) can shape the fuel economy of the vehicle fleet and foster a shift to low-carbon vehicle technologies.
- **Planning instruments,** such as integrated urban and transport planning (local) that can foster mixed use, polycentric urban development, compact urban form and sustainable urban mobility planning (can be supported by national guidelines).
- **Economic/fiscal instruments,** such as fuel taxes, vehicle taxation linked to fuel economy standards or directly to $CO_2$ emission levels (national level), or congestion charges (local) that can discourage the use of motorised vehicles and promote the adoption of more fuel-efficient vehicles. Revenues generated by these policies can be redistributed to low-carbon transport modes and technologies.
- **Public spending/Investments** in infrastructure, such as walking, cycling and public transport improvements (local) and research and development of low-carbon fuels and vehicles (national).
- **Communication and information instruments,** such as vehicle fuel-efficiency labelling (national), driver training and information campaigns (local, regional, national), and multimodal journey planners (local).

Table 1-2: Examples of instruments as possible centrepieces of NAMAs (Source: GIZ)

| Type of instrument | Examples of possible instruments | Potential elements of NAMAs |
|---|---|---|
| **Strategy/Policy** | **Planning** | National: National urban policies and guidelines<br>Local: Land-use plans, integrated urban and transport planning, urban mobility plans |
| **Policy** | **Regulatory instruments** | National: Fuel economy standards, speed limits<br>Local: environmental zoning, bus-route optimisation, parking management, high-occupancy vehicle lanes |
| | **Economic/fiscal instruments** | National: Vehicle taxation and subsidies, fuel taxation<br>Local: road pricing, bus ticket pricing, parking fees, sustainable transport fund |
| | **Communication and information** | National: Vehicle labelling |
| **Programme** | **Public spending/investments** | National and local: public spending in form of co-funding for local projects fulfilling sustainability criteria set out at national level e.g. in a National Sustainable Urban Transport Policy; co-funding of (pre-)feasibility studies and capacity building |
| | **Communication and information** | National and local: Public awareness campaigns for low-carbon transport modes, eco-driving schemes, promotion of teleworking |
| **Project** | **Public spending/investments** | National: Long distance rail (passenger or freight), inland waterways for freight<br>Local: Logistic centres, Bus Rapid Transit, metro, walking and cycling infrastructure, electric vehicle charging stations |

Transport decision makers can use and combine these instruments in strategies, policies, programmes or projects (see table 1-2) as centrepieces of their NAMAs. All of them are eligible to be registered as NAMAs, either individually or as a package (UNFCCC/UNEP/UNDP, 2013). The main motivation to develop these different types of measures and instruments into NAMAs usually includes a combination of interest in international recognition, need for technical assistance and/or a need for additional direct funding.

Ideally, multiple interventions and instruments should be developed and implemented in combination, in order for them to complement and reinforce each other, and also to seek synergies with other policy objectives, which may help to generate support and overcome implementation barriers.

Further Reading: Chapter 2 “Strategies and policies: Towards intelligent policy packages” in the „Low-Carbon Land Transport“ Policy Handbook provides a helpful overview and interesting details on the design of policy packages.

**Box 4:**

**Sector strategy: Sustainable Urban Transport NAMA – TRANSPeru**

The SUT NAMA in Peru comprises a comprehensive package of different measures. These measures range from activities with a countrywide focus aiming at improving overall framework conditions for sustainable urban transport in Peru, to measures targeting Lima/Callao as the main source of transport related GHG emissions in Peru, and others addressing medium sized cities with a considerable growth in transport demand. The NAMA introduces a programmatic approach using a comprehensive, multi-donor driven policy matrix to promote core policy reforms along the Avoid-Shift-Improve approach and across levels of government. Therefor the NAMA can be seen as a strategy to transform the urban transport sector in Per (sector strategy).

Further reading: www.transport-namas.org/projects/transfer-partner-countries/peru/

**Policy and programme: Improvement of Road-based Freight sector, Colombia**

The Colombian freight NAMA is based on three main elements: 1. The establishment of fuel and vehicle efficiency standards for new freight vehicles, 2. a scarping incentive scheme for vehicles >25 years, and 3. the improvement of entrepreneurial and logistic organisation of the sector. With the objective of improving economic competitiveness and environmental performance of the sector, the Government of Colombia had implemented this mix of regulatory and economic incentives by means of three national policies, namely CONPES 3489, CONPES 3547, and CONPES 3759 on which the NAMA is based.

Further reading: www.transport-namas.org/projects/transfer-partner-countries/colombia/

**Programme: Sustainable Urban Transport Programme Indonesia (SUTRI), Indonesia**

NAMA SUTRI aims to transform urban transport in Indonesia with a mix of capacity-building and investment measures provided through a national urban transport programme. In the first phase this includes: (1) the establishment of a Technical Support Unit in the Ministry of Transport that will provide technical guidance and capacity development for local governments, and (2) the development of an effective funding mechanism to co-finance the implementation of public transport and transport demand management projects. In seven pilot cities, the NSP will (3) develop a project pipeline of eligible demonstration projects and (4) co-finance the implementation of demonstration projects in up to five cities (which might include bus fleet investment, improvement of public transport corridors, parking management and pedestrian programmes).

Further reading: www.transport-namas.org/projects/transfer-partner-countries/indonesia/

**Programme: Energy Efficiency Programme for Freight Vehicles, Mexico**

This NAMA aims to reduce GHG-emissions from the road freight transport sector via three main mitigation activities: (1) the introduction of energy-efficient driving courses as a mandatory part of the driver licence process (taken by road hauliers every two years), (2) massive implementation of fuel-saving technologies such as aerodynamics, Automatic Inflating Systems (AIS) and energy-efficient tires and (3) The improvement of existing emission standard regulation (NOM-044).

Further reading: www.transport-namas.org/projects/t-nama-countries-iki/mexico

**Project: Passenger Modal Shift from Road to Rail – The Gautrain Case, South Africa**

This NAMA covers the modal shift of private passenger vehicles to the Gautrain electric rail corridor directly, or through the feeder bus system. The programme is restricted to the Gautrain service corridor, which is itself an area of economic stimulus within the Gauteng Provincial Government. The NAMA is expected to be on-going, especially in light of Gautrain's expansion and integration into national mass transit networks.

Further reading: www.transport-namas.org/projects/transfer-partner-countries/south-africa/

## 1.2 Select most suitable measures

Jakarta, Indonesia; Photocredit: Manfred Breithaupt/2013

**Results of this step:**
List with priority NAMA(s); Initial NAMA concept note(s)

NAMA Screening Tool; Initial NAMA Concept Note template

The previous subsection showed that a wide spectrum of possible measures can be developed as a NAMA. In the preparatory stage of a NAMA, a first step is listing possible mitigation options. From such a list of possible measures, the most suitable option(s) need(s) to be selected – the focus of this subsection – and then designed in more detail, which will be discussed in the next subsection). Practical experience suggests that a set of multiple criteria should be considered in order to select the most viable option with good chances for implementation.

GIZ has developed a **NAMA Screening Tool to support this decision** (see TRANSfer Toolbox). The tool gives guidance to structure the process of screening and selecting potential NAMAs, rather than aspiring to lay out a template approach with objective outcomes. Methodologically, this tool follows a multi-criteria and multi-stakeholder approach. In addition to transport policy-makers, other stakeholders from government, private sector and consultancies/academics may also be involved. In the end, selecting potential NAMAs is a political decision. It is a flexible tool that can be adjusted to specific circumstances. It might be used in a rather quick and pragmatic process mainly based on expert judgement. It can also be applied as part of a longer term decision making process that includes more detailed analyses.

The following 4 key criteria are recommended for the NAMA screening and selection process. Acknowledging each country is unique and the framework for the NAMA selection process will differ, criteria can be added, deleted and/or modified to the specific context.

The following **4 key criteria** are recommended for the NAMA screening and selection process. Acknowledging each country is unique and the framework for the NAMA selection process will differ, criteria can be added, deleted and/or modified to the specific context.

### Criterion 1:
### Likelihood of successful implementation

- Development status of the measure: idea, existing regulation, included in budget, implementation started, etc.
- Number and diversity of stakeholders, social acceptance
- Technical and operational feasibility taking capacity of main stakeholders into account
- Commitment of core decision makers
- Potential to overcome any further barriers to implementation

### Criterion 2:
### GHG mitigation potential[6]

- Direct emission reduction potential of the measure
- Indirect or long-term mitigation impacts

### Criterion 3:
### Further benefits for sustainable development/co-benefits

- Social: access to transport, road safety, comfort increase
- Economic: economic growth, job creation, congestion reduction, security of energy supply
- Environmental: local air quality, noise reduction
- Institutional: improved institutional set-up and framework conditions

### Criterion 4:
### Economic and financial feasibility

- Abatement cost per tonne of $CO_2$-eq
- Relation of costs[7] and expected benefits
- Cost of MRV (complexity in methodology; data availability & need for new data; technical capacity of core stakeholders)
- Feasibility to close funding gaps with public resources (domestic or international)
- Access to finance (domestic and international, public and private)
- Financial risks

[6] Ideally, ex-ante assessments use the same methodology as ex-post evaluations, making assumptions on future developments. Depending on data availability, however, ex-ante estimations of GHG mitigation potentials may use simplified approaches to give orientation on the rough size of likely emission reduction. Please also see Reference Document for a more detailed discussion of ex-ante estimations of GHG mitigation potentials of transport meausures.
[7] Consider all costs: technical design, construction, enforcement, operation and maintenance, capacity building, MRV.


Manila, Philippines, Photocredit: Manfred Breithaupt/2013

The selection process should involve consultation between several governmental departments/ministries and further government stakeholders (depending on the case, this might also include different levels of government), as well as the private sector and consultancies/ academia. Examples of matrices that can be used to perform this process are presented in the GIZ NAMA Screening Tool and further tools for NAMA screening (see TRANSfer Toolbox).

It might be quite helpful to develop an „Initial NAMA Concept Note" (up to 5 pages long) for the most promising NAMA(s) to facilitate mutual understand of the NAMA(s) being considered by all stakeholders. Such an initial concept note describes key features of the proposed NAMA (see textbox on Key elements of an Initial NAMA Concept Note/NAMA Factsheet)

The TRANSfer Toolbox offers a template that facilitates the development of such a note (see TRANSfer Toolbox). Depending on the specific circumstances (number of potential NAMAs, number of institutions involved, familiarity with the NAMAs, etc.), it may be appropriate in some cases to develop the initial concept notes at an earlier stage, while in others it might be at a later stage of the selection process. In any case, practical experience shows that these notes can help clarifying conceptual aspects and structure the NAMA(s).

**Box 5:**

**Key elements of an Initial NAMA Concept Note/NAMA Factsheet**

- **Objective:** facilitate mutual understanding of the main ideas of the NAMA among key stakeholders; support initial discussions with possible funders
- **Recommended length:** up to 5 pages
- **Recommended contents:**
  - rationale for the NAMA
  - planned measures
  - involved stakeholders
  - main barriers and support needs
  - costs and financing
  - expected impacts (GHG and further benefits)
  - schedule for NAMA preparation and implementation


Medellin, Colombia, Photocredit: Carlos F. Pardo/2013

**Box 6:**

**Targeting sustainable development benefits**

Parties to the UNFCCC have repeatedly highlighed that the NAMA concept is designed to foster both climate change mitigation and sustainable development. Climate change is only one of many aspects that drive policy change towards sustainable mobility. Other sustainable development aspects are often of more immediate importance, some of which are explored in the following section. Climate change mitigation can be considered a co-benefit of sustainable transport measures, even though in UNFCCC terminology it is defined the other way around.[8] Whatever the angle under which a measure is developed, it is vital for its long-term success that economic, social and environmental aspects are not only taken into account, but also given equal weight.

From a transport NAMA perspective, this means that along with GHG mitigation, the following benefits should be targeted in its development:

- **Economic benefits:** travel time savings, travel money savings, system reliability, revenues from fees, charges and tickets, job creation, energy security
- **Social benefits:** health, traffic safety and security, access to affordable and clean mobility, social cohesion and equity, passenger comfort, urban-rural connectivity, gender equality
- **Environmental benefits:** air quality, resource consumption, noise, water quality and quantity, soil condition, energy use, biodiversity

These benefits are often the driving factors for policy intervention, particularly at the local level. As transport relies almost entirely on petroleum products, energy security is a major issue for the sector. There is a direct link between energy security and climate change mitigation actions that focus on fuel-switch options, such as biofuels and electrification. Demand side measures, such as fuel efficiency, shifting to more efficient transport modes and compact urban design, are likely to improve access to mobility services and reduce transport costs, and thus positively affect productivity and social inclusion and provide better access to jobs, markets and social services. Improved access is likely to have a positive impact on employment. A major cost factor generated by inefficient transport systems is congestion. Time lost in traffic was valued at 1.2% of GDP in the UK, 3.4% in Dakar, Senegal, 4% in Manila, Philippines, 3.3% to 5.3% in Beijing, China, 1% to 6% in Bangkok, Thailand and up to 10% in Lima, Peru. Another major factor where climate change mitigation actions can offer synergies with other objectives is related to the various health impacts of transport activities, such as air pollution, noise, vibration and road safety.[9]

Publication „Sustainable Development Benefits" available at http://transport-namas.org/resources/publications/

Table 1-3: Greenhouse gas mitigation potential and co-benefits potential (adapted from IPCC 2014 and Figueroa Meza et al. 2014)

| Approach | Area of focus | Energy savings with GHG mitigation potential | Sustainable development benefits |
|---|---|---|---|
| **Avoid** | Activity (reduction and management: short distances, compact cities and mixed use) | Potential to reduce energy consumption by 10% to 30% (TFL 2007; Marshall 2011) | Reduced travel times; improved air quality, public health, safety and more equitable access |
| **Shift** | Structure (shift to more energy efficient modes) | Potential for energy efficiency gains varies greatly, 10% to 30% reductions (IEA 2012, Fulton et al. 2013; Replogle et al. 2014)<br>Fulton et al. 2013; Replogle et al. 2014) | Reduced urban congestion and more equitable access |
| **Improve** | Intensity (vehicle fuel efficiency) | Efficiency improvement of 40% to 60% by 2030 feasible at low or negative costs (IEA 2012; GEA 2012) | Improved energy security, productivity and affordability |
| | Fuel (switch to electricity, hydrogen, CNG, biofuels and other fuels) | Changing the structure of the energy consumption, but not necessarily overall demand. | Diversification of the fuels used contributes to climate, air quality and/or energy security objectives |

[8] Official documents of the UNFCCC distinguish between 'GHG benefits' and 'co-benefits'. The former term refers to climate change mitigation effects, the latter to any other effects related to sustainable development. From a climate perspective, co-benefits are additional to the objective of reducing GHG emissions.
[9] For an overview of synergies and co-benefits see Sims et al. 2014.

# 1.3 Design selected measures in more detail

**Results of this step:** technical studies; appraisal mission reports; barriers identified; direct mitigation, supportive and organisational measures defined



Identification of barriers and supportive measures; realization of specialized consultancies; Full NAMA Concept template


Abu Dhabe, United Arab Emirates; Photocredit: Manfred Breithaupt/2013

After the identification of potential measures for development as a NAMA (subsection 1.1) and a more detailed screening, culminating in the selection of the most suitable measures by involved stakeholders (subsection 1.2), this subsection deals with the next step to build a solid NAMA concept: the more detailed design of the selected measures.

According to GIZ's experience, measures of a NAMA are usually of three types, which must be specified before moving on to its detailed design.

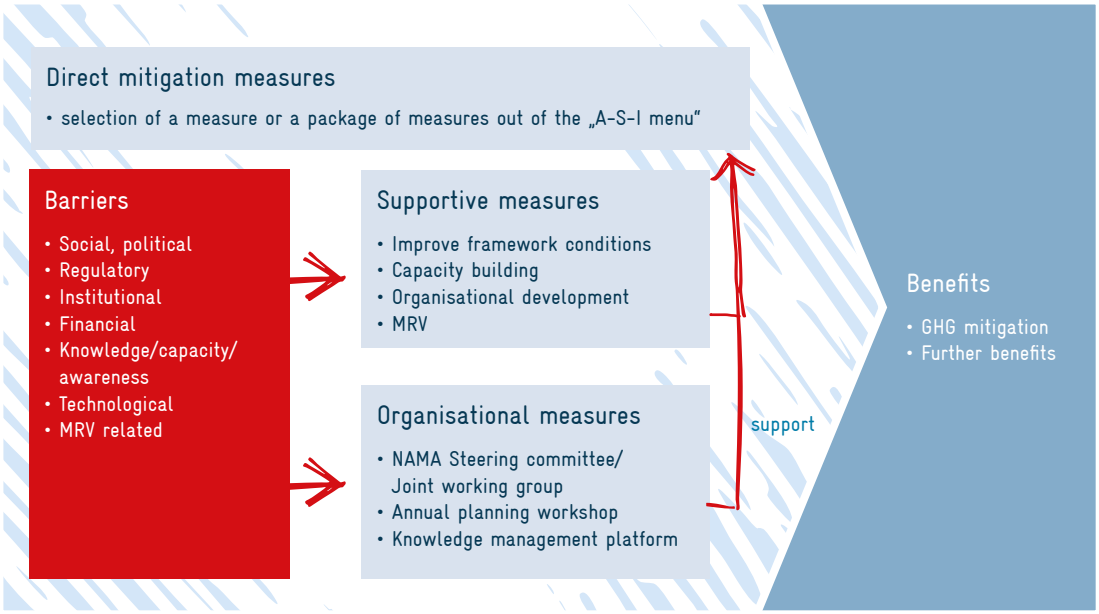
(1) **Direct mitigation measures,** i.e. measures that ultimately reduce GHG emissions, such as a new fuel economy standard, introduction of low carbon vehicles or equipment like low resistance rolling tires, an improved public transport system that shifts demand from private vehicles to public transport, etc.

(2) **Supportive measures,** i.e. measures intended to strengthen individual or institutional capacities and to improve the framework conditions required for the implementation of the direct mitigation measures, such as training courses, support in setting up a public transport authority for improved planning, activities to improve enforcement of existing regulation, etc. Activities like data collection and processing and further activities required to set-up and operate the MRV system belong to this category as well.

(3) **Organisational measures (process coordination and management),** i.e. measures for sound management and coordination of the overall NAMA process, such as the establishment and operation of a Steering Committee or a Working Group, including development and regular monitoring of a work-plan, operation of an online platform for knowledge management, reporting and public relations related to the NAMA, etc.

Lima, Peru; Photocredit: Jeroen Buis/2013

Figure 1-2: Relationship of NAMA measures, barriers and benefits (Source: GIZ TRANSfer Project)




### Type 1: Direct mitigation measures:

The specification of the **direct mitigation measures** depends on the type of the particular measures chosen for the NAMA and their stage of development in the country as well as already available information. In most cases it will be necessary to contract **specialised consulting firms** that can carry out and advise on the detailed technical design. Core stakeholders should play an active role in TOR development and accompanying technical studies during their elaboration. For "project NAMAs" this step usually results in technical design/engineering studies. In the case of "policy or programme NAMAs" the focus is rather on designing new regulation and incentive schemes; consensus building among relevant stakeholders is often an important co-benefit of this.

### Type 2: Supportive measures:

In many cases, the implementation of direct mitigation measures is not straightforward. Typically, certain barriers stand in the way, which transport policy-makers pushing a NAMA should pay particular attention to. A barrier analysis is a useful tool for assessing the current situation and to help define activities to clear these hurdles. A **barrier analysis** compares a vision of the future with the current scenario and identifies the key variables that prevent a future scenario from becoming a reality (TNA 2013). Some potential barriers to effectively and efficiently implementing transport policies and projects are: lack of institutional coordination and political support, lack of finance, lack of technical capacity, behavioural issues (individual and corporate) that affect take-up, geographical and environmental issues (e.g. hot climate, mountainous region), etc.

A lack of domestic institutional coordination can be overcome through a working group for NAMA development and implementation (see next subsection). If a country has set up such a group, it could become a long-term catalyst not only for NAMA development, but also for successful policy preparation and implementation in general.

Developing countries might also identify a need for technical support to prepare and implement NAMAs. Capacity development and other supportive measures can address the institutional or individual capacity of an implementing agency, e.g. through policy advice, organisational development or training measures. Capacity development may also be required in order to improve data availability, to provide knowledge on a certain technology or to facilitate complex stakeholder-coordination processes.

Capacity building can include:

- MRV methodologies
- Data collection and analysis (e.g. vehicle data validation, household travel surveys);
- Development of transport models;
- Training for transport planners and engineers;
- Development of local, regional or national low-carbon transport plans;
- Forming or strengthening institutions that develop, implement and evaluate strategies for low-carbon transport.

Palembang, Indonesia; Photocredit: Manfred Breithaupt/2013

The barrier analysis helps to identify means to overcome the barriers and facilitate the implementation of a NAMA's direct mitigation measures that ultimately lead to the expected benefits in terms of GHG mitigation and further sustainable development benefits. These measures are referred to as **supportive measures.** Table 1-4 and the associated tool can support this process (see as well TRANSfer Toolbox). You might use table 1-4 to specify supportive and organisational measures for your particular case.

You might have noticed that this is linked to the development of the MRV approach and NAMA financing (Sections 2 and 3 of this handbook). More detailed information that might be generated in dedicated work on MRV or financing can feed into the barrier analysis and/or the other way round. In the end, it is important to give the barrier analysis the attention that it deserves, to consider financial and MRV aspects in the process and to derive actions that are required to overcome identified barriers. In the financing section, all these measures will be broken down into activities including cost estimations (see Section 3).

**Box 7:**

**Appraisal process for supported NAMAs**

In the case of supported NAMAs, such as those that receive funding from the NAMA Facility, an important part of the detailed design of selected measures is the in-depth appraisal process, which international donors require to formally approve a NAMA proposal in order to provide co-funding for its implementation. Have a look at the procedures and required documentation that the NAMA Facility requires here:

http://www.nama-facility.org/call-for-projects/selectionprocess.html

Table 1-4: Barriers and supportive measures

| Types of barriers | Identified barriers for NAMA implementation | Required action (=supportive and organisational measures) |
|---|---|---|
| Social and political | | |
| Regulatory | | |
| Institutional | | |
| Financial | | |
| Lack of knowledge/capacity/ awareness | | |
| Technological | | |
| MRV related barriers | | |

### Type 3: Organisational measures:

Regarding the specification of the **organisational measures** it is necessary to agree upon a mechanism and structure for overall stakeholder coordination and all other aspects related to NAMA management during its development and implementation. The next subsection illustrates what stakeholder involvement can look like and gives a real-world example of a steering structure.

Once the main stakeholders have specified and agreed upon the different types of measures, the next step is to expand the "Initial NAMA Concept Note" into a **"Full NAMA Concept"**. This full NAMA concept describes the NAMA in more detail on approximately **30 to 50 pages** and might be accompanied by technical appendices with details on specific design aspects of the mitigation measures and ex ante GHG mitigation estimations.

A Full NAMA Concept Document can be used to **facilitate discussions with possible funders** (domestic and international, public and private) and can help **fine-tune NAMA concepts** to meet the eligibility criteria of international donors. Such a document gives a comprehensive overview of the NAMA and presents information on the mitigation measures, MRV and financing. The current and forthcoming sections of this handbook help you to generate the content. Typical elements covered in a Full NAMA Concept Document are described in the following textbox on Key elements of a Full NAMA Concept Document.

Some examples of Full NAMA Concept Documents can be found in the Transport NAMA Database[10] and as well on the TRANSfer Project website[11]. To facilitate the development of a full NAMA concept, the TRANSfer Toolbox offers a template – which can be adapated to your specific needs. The template contains an annotated outline indicating what content is useful to present in each section (see "Full NAMA Concept template" in the TRANSfer Toolbox).

Medellin, Colombia; Photocredit: Carlos F. Pardo/2009

Manila, Phillipines; Photocredit: Ko Sakamoto/2013

**Box 8:**

**Key elements of a Full NAMA Concept Document**

- **Objective:** fine tune NAMA concepts; comprehensive overview of the NAMA; support discussions with possible funders and related proposals/applications
- **Recommended length:** 30 – 50 pages plus technical appendices
- **Recommended content:**
  - Executive summary for decision makers
  - Overview of the sector
  - Barriers
  - The NAMA: Potential, measures, targets & expected impacts
  - MRV approach
  - Financing the NAMA: required resources and financing mechanisms and structure
  - Technical annexes (e.g. on technical design and ex ante GHG mitigation estimations)

[10] See www.transport-namas.org/resources/full-nama-concept-docs/
[11] See the country sections on: www.transport-namas.org/transfer-partner-countries

# 1.4 Involve relevant stakeholders

**Results of this step:**
Overview of key stakeholders and their relationships; NAMA Working group or Steering Committee structure clearly defined

Stakeholder map; NAMA Coordination (Steering Structure)

The previous subsections (subsections 1.1 to 1.3) gave an overview of the main steps toward properly designed mitigation measures; this subsection draws attention to the issue of **stakeholder involvement.** Adequate stakeholder involvement is an important factor for success throughout the entire NAMA cycle and can be considered a **cross-cutting issue,** which is relevant not only for the design of the mitigation measures (section 1 of this handbook), but also during the development of the MRV approach and the process to structure the financial side of the NAMA. This subsection illustrates the kind of main stakeholder groups that might be of relevance, show ways how to scope them and highlights examples of possible steering structures to coordinate and manage a NAMA.

Jakarta, Indonesia; Photocredit: Manfred Breithaupt/2013

While governments tend to be the driving forces behind the development and implementation of NAMAs (UNEP Risø Centre, 2014) a NAMA development process should be based on a **broad coalition of key stakeholders** including public sector, private sector and specialized experts from academia, consultancies, and NGOs. Public sector participation is important to ensure the long-term commitments and stability that are required to deliver and achieve a transformational change to sustainable low-carbon mobility.

As the name indicates, a **Nationally Appropriate Mitigation Action,** i.e. a NAMA, at least requires the support of **national governments,** even if they do not lead the NAMA development when the initiative comes from a local or regional government or even from the private sector. However, in many cases the initiative does come from the national level, and Ministries of Transport (or their equivalent) are well positioned to coordinate the development and implementation of transport NAMAs that fit the context of the country's sector.

In most cases, countries select one government entity and assign to it the overall, cross-sectoral coordination of a country's NAMA pipeline, for example the Climate Change Commission in the Philippines, the National Planning Ministry in Indonesia or the Ministry of Environment in Colombia. These **"NAMA focal points"** are usually responsible for coordinating the national climate change policy agenda and serve as the link to the UNFCCC process. They assume a **general coordination role.**

Palembang, Indonesia; Photocredit: Manfred Breithaupt/2013

The actual responsibility for the design and implementation of a NAMA is normally with the relevant **line-ministries.** Mitigation actions that are implemented at local or provincial level require the additional involvement of the **sub-national government and local authorities.** The **National Focal Point for Climate Change** can undertake the submission of a NAMA proposal to the **UNFCCC registry,** but other parts of government can also be designated to do so.

During NAMA development **additional government agencies** should be involved, particularly the ministry of finance and/or the ministry in charge of economic development and ideally the prime ministers or president's office. Close collaboration between several national levels, and – as the case may be – entities at sub-national levels, is recommended from an early stage to ensure widespread political endorsement. For the development of a supported NAMAs it may [?] be crucial to find an **international donor** willing to contribute to NAMA financing. To grow support it is important to involve potential funders at an early stage of NAMA development in order to consider their requirements at the outset.

A helpful tool to get an overview of the different stakeholders and their relationships is the **"Stakeholder Map"** (see TRANSfer Toolbox) and figure 1-3 below. A stakeholder map for a particular project can be easily developed and provides a visual overview of the stakeholder landscape. In case of NAMAs with a very broad scope (e.g. entire (sub-)sector reforms) it might be helpful to come up with individual stakeholder maps for certain elements of a NAMA.

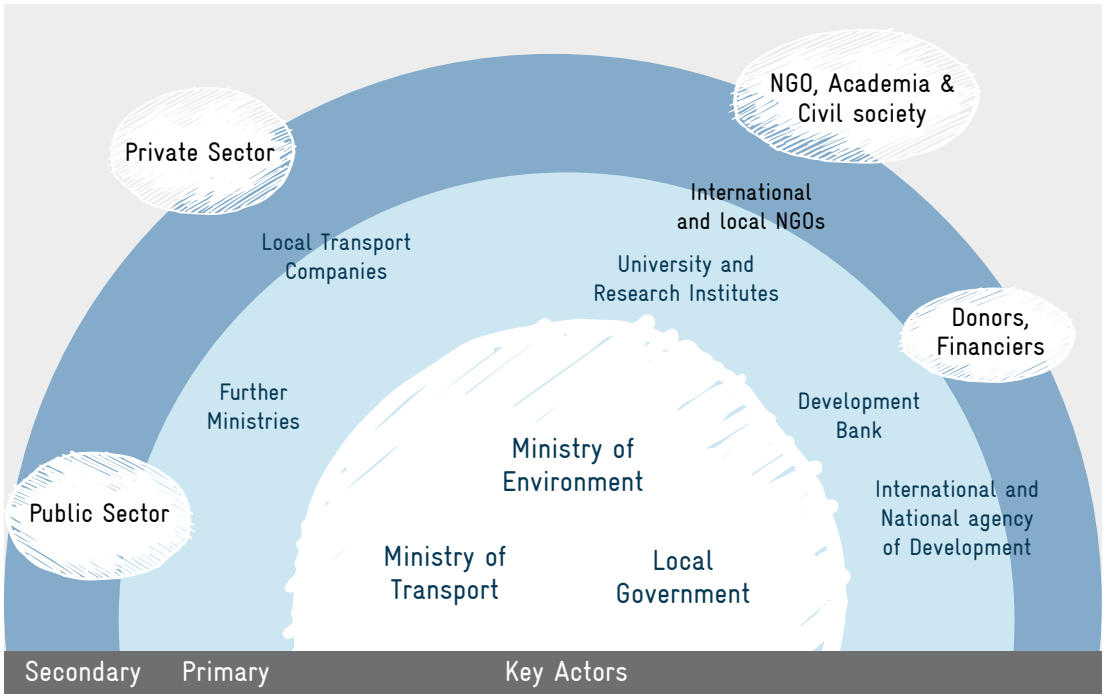
**Box 9:**

**NAMAs at local level**

Local Mitigation Actions at sub-national levels require different forms of stakeholder involvement. Depending on the administrative structure and distribution of responsibilities in a country, transport and planning authorities at local and provincial levels may be best positioned for the process of NAMA development and implementation. In any case, it is recommended that the national focal point to the UNFCCC is involved from an early stage of the process.

Lima, Peru; Photocredit: Carlos F. Pardo/2013

Figure 1-3: Generic example of a stakeholder map (Source: GIZ TRANSfer Project)



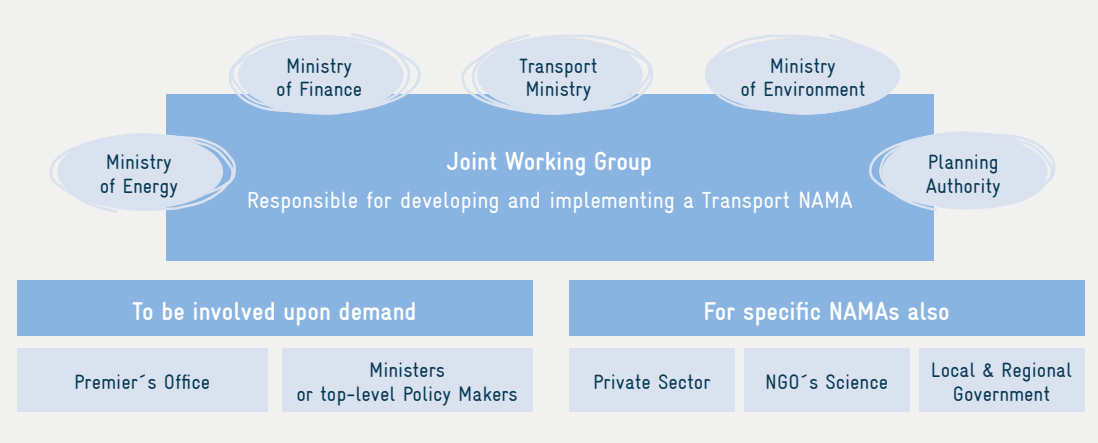
Structured stakeholder coordination is strongly recommended to facilitate NAMA development and implementation, either in the form of a **joint working group** or a **steering committee.** A stakeholder map can provide useful input for the design of a NAMA's overall stakeholder coordination and management structure. The establishment of a joint working group can help the development of a NAMA as several departments will usually be required for the implementation of the selected measures.

We suggest that **a joint working group is established at an early stage** of the development process for a NAMA proposal. For the constitution of a working group **existent mechanisms or structures must be considered** – and whenever possible – used to avoid overlapping or multiple efforts. Such working groups normally hold meetings at regular intervals until the concept for the transport NAMA is developed into a full grown NAMA proposal. Its activities might also extend well into the implementation stage of the transport NAMA.

The **membership** of the joint working group is subject to the governance process of each country. Such a joint working group may include experienced technical experts or decision-makers from the relevant departments who, by virtue of their position, are able to promote the outcomes of the working group within their departments. In addition to national government representatives, it is recommended to include local governments, NGOs, research institutes and private-sector representatives (e.g. business associations) as guests or full members in the group, depending on the scope of the planned activities. Continuity is key to success and effectiveness. Therefore, it is helpful if at least a core group of the same individuals participate in the entire process.

Successful examples show that it is important to find a way for efficient and effective involvement of **decision making and working/technical level.** Working/technical levels are normally well-represented and actively taking part in regular meetings of a joint working group or steering committee. Involvement of high-level decision makers and approval procedures of certain elements of a NAMA can take place in various forms. They vary depending on the decision-making structures and practices in a country. In NAMA examples from Mexico and other countries, high-level decision makers are involved via individual meetings and participation in the joint working group in particular sessions for decision makers.

Figure 1-4: Structure of Joint Working Group for NAMA development (Source: Wuppertal Institute)



Typical **elements of a joint working group or steering committee** that should be defined and agreed upon by the stakeholders when setting up such a structure are listed below; further details can be found in the respective TRANSfer Tool: "NAMA Coordination (Steering Structure)":

- **Objectives and functions:** serve as platform for discussion and decision making for the design and implementation of the NAMA; report to ministers/ vice-ministers about NAMA progress; coordinate the planning and implementation of specific acitivities and create synergies between the members and further stakeholders; develop an annual work plan and monitor its fulfillment.
- **Structure:** organisational chart with a brief explanation.
- **Description of specific functions of the Coordinator, the Technical Secretariate and the Members** of the working group/committee and the responsible institution and individual(s).
- **Meetings:** including a specification of programme/ scope (e.g. a standard meeting agenda), frequency, meeting minutes and venue.

Mexico City, Mexico; Photocredit: Carlos F. Pardo/2006

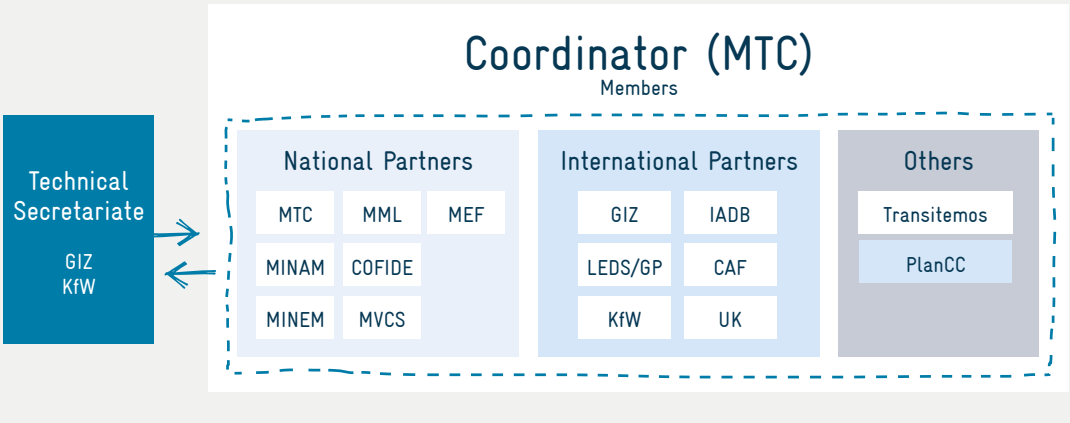
**Box 10:**

**Steering Committee for the Urban Transport NAMA in Peru (TRANSPerú)**

The Steering Committee is tasked to effectively and efficiently develop and implement the NAMA. The Committee consists of the most relevant national and sub-national public entities and institutions, private sector and international partners. It serves as a common discussion and decision-making platform, reports to the vice-ministers, coordinates the activities within the framework of the NAMA, and identifies synergies among the partners. The Committee meets on a bi-monthly basis and follows an annually established joint work plan. Working rules have been established in order to facilitate the meetings.

The role of the coordinator to invite and guide through meetings is assumed by the Ministry of Transport (MTC). The Committee is supported by a Technical Secretariat, which supports the preparation, realisation and follow-up of all meetings. Additionally, itmonitors the joint work plan. The members of the Committee each assume an active role in at least one of the activities under the NAMA.

Figure 1-5: Steering Committee of Peruvian Sustainable Urban Transport NAMA (Source: GIZ TRANSfer Project)



## 1.5 Checklist and tips for further reading

The steps outlined in this handbook only describe one possible way to approach the design of mitigation measures of a NAMA. In reality, this process will have to be adapted to the national circumstances and corresponding decision-making processes. Nevertheless, the major steps of the process presented in the handbook can be used as guidance, as they constitute the key elements that enable successful development. They are vital to receive the necessary political, technical and financial support to endure after implementation.

| Checklist: Designing Mitigation Meausure(s) | ✓ |
|---|---|
| Key **stakeholders** actively participate in the process. | |
| **Long-list** with potential NAMA options is developed. | |
| **Short-list** with top priority NAMA options(s) agreed among key stakeholders. | |
| **Initial NAMA Concept Note** is developed and agreed among stakeholders. | |
| Main **conceptual, information and data gaps** for detailed design identified. | |
| Detailed conceptual/technical design **studies/consultancies** carried out. | |
| **Mitigation measures clearly specified** (direct mitigation measures, supportive measures, organisational measures). | |
| **Capacity building needs** identified (at individual, organisational and system levels). | |
| **A mechanism for coordination/steering structure** for NAMA development and implementation is designed, accepted by core stakeholders and operational. | |

Tips for further reading

**GIZ TRANSfer Project "Transport NAMA Toolbox"**

- Factsheets on different sustainable transport measures for potential NAMAs, Available at transport-namas.org/resources/toolbox/

**GIZ Sourcebook for Decision-Makers in Developing Cities**

All modules available online in several languages at http://www.sutp.org/en/resources/publications-by-topic/sutp-sourcebook-modules.html

- Module 1d. *'Economic Instruments'* (Manfred Breithaupt)
- Module 1g. *'Urban Freight in Developing Cities'* (Bernhard O. Herzog)
- Module 2a. *'Land Use Planning and Urban Transport'* (Rudolf Petersen)
- Module 5e. *'Transport and Climate Change'* (Holger Dalkmann and Charlotte Brannigan)
- Module 5h. *'Urban Transport and Energy Efficiency'* (Susanne Böhler-Baedeker and Hanna Hüging)
- Module 5g. *'Urban Transport and Health'* (Carlos Dora, Jamie Hosking, Pierpaolo Mudu, Elaine Ruth Fletcher)

**Additional sources**


- Bongardt, D *et al.,* (2013) *Low-Carbon Land Transport - Policy handbook. Chapter 2.*
- Bongardt, D, Breithaupt, M, and Creutzig, F (2010) *Beyond the fossil city: Towards low carbon transport and green growth, Sustainable Urban Transport Project (SUTP),* GIZ, Eschborn, Germany. Available at https://www.sutp.org/files/contents/documents/resources/B_Technical-Documents/GIZ_SUTP_TD6_Beyond-the-Fossil-City_EN.pdf
- Sakamoto, K, Dore, C and Jinca, A (2011) *NAMA Guidance Document for the Transport Sector.* Available at https://docs.google.com/file/d/0B45swsIRHujVdGJEdTdURVA5T1k/edit
- Dablanc, L (2010) *Freight transport for Development Toolkit: Urban Freight.* World Bank/DFID. Available at http://siteresources.worldbank.org/EXTURBANTRANSPORT/Resources/341448-1269891107889/urban_freight.pdf
- Litman, T (2012) *Win-Win Transportation Emission Reduction Strategies.* Victoria Transport Policy Institute, Victoria, Canada. Available at www.vtpi.org/wwclimate.pdf
- Littmann, T (no date) *Transportation Demand Management (TDM) Encyclopedia.* Available at http://www.vtpi.org/tdm

# Section 2

## MRV: Measurement, Reporting, Verification

# 2. MRV: Measurement, Reporting, Verification

## Introduction

A vital step for successful implementation of a strategy, policy, programme or project is the assessment of its impact. When developing sustainable transport measures as a NAMA certain aspects have to be measured, reported and verified – or MRVed.

Although the original UNFCCC terminology reads "measurement", the term MRV is today often translated into monitoring, reporting and verification. In fact, monitoring may be the more suitable term since many important impacts cannot be directly measured in a strict sense of the word. In this handbook we nevertheless stick to the official terminology of measurement.

Measurement, reporting and verification can be defined in the context of NAMAs as follows (UNFCCC/UNEP/UNDP, 2013: 53):

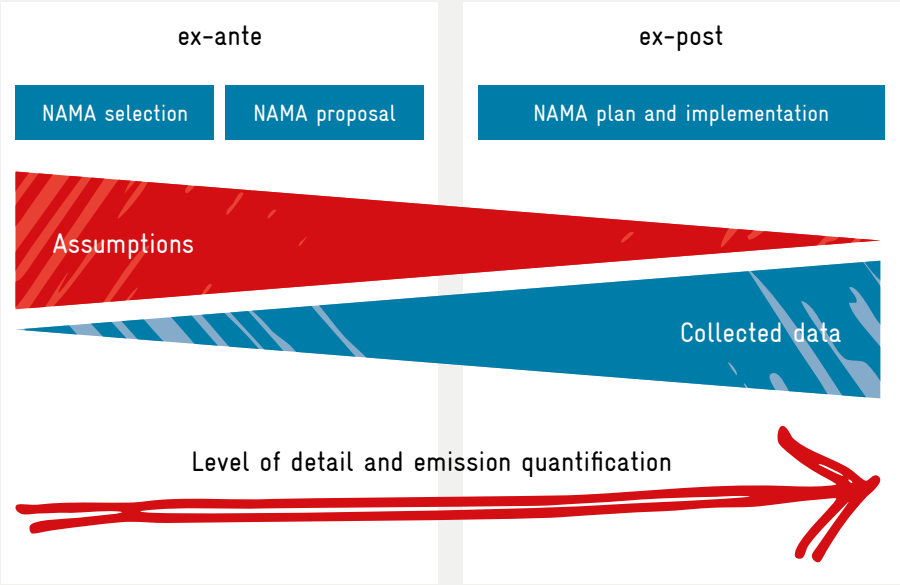
Table 2-1: Measurement, Reporting and Verfication

| | |
|---|---|
| **Measurement** | **Collect relevant information on progress and impact** |
| **Reporting** | **Present the measured information in a transparent and standardised manner** |
| **Verification** | **Assess the completeness, consistency and reliabiltiy of the reported information through an independent process** |

As Table 2-1 shows, MRV generally refers to ex-post monitoring and progress reporting. Nevertheless, quantifying emissions in the transport sector is often also required to estimate the potential impact of an intervention before its implementation (ex-ante) (see figure 2-1). The purpose of ex-ante estimations is to obtain information on the expected contribution of a policy or measure towards GHG reductions, which may be important to policy makers during the NAMA identification process, in designing mitigation measures and to potential donors who decide on funding proposals (compare section 1). (Further motivations for quantifying the GHG effects of NAMAs before and during/after implementation are summarised in box 11. Figure 2-1 illustrates the different occasions during NAMA development and implementation, when quantification of impacts becomes relevant. Ideally, ex-ante assessments would use the same methodology as ex-post evaluations; in reality, however, ex-ante estimations are often based on much rougher, simplified approaches than ex-post monitoring and necessarily build much more on assumptions of likely future developments instead of real-world data. In other words, the level of detail of emission quantifications increases from ex-ante to continuous ex-post assessment (for more information on ex-ante vs. ex-post assessments see sub-section 2.2.4).

Jakarta, Indonesia; Photocredit: Stefan Bakker/2011

Figure 2-1: Occasions of emission quantification during NAMA development and implementation




**Box 11:**

**Example 1: Objectives for MRV of NAMAs**

Before policy implementation:

- Choose among policy options based on their expected GHG effects
- Improve the design of policies by understanding the effects of different design choices
- Define GHG reduction goals based on potential GHG reductions from policy options
- Report on expected future GHG effects of policies and actions being considered or implemented (for domestic or international purposes)
- Attract and facilitate financial support for mitigation actions by estimating potential GHG reductions

During or after policy implementation:

- Understand whether policies and actions are effective in delivering the intended results
- Inform and improve policy implementation
- Decide whether to continue current activities or implement additional policies
- Learn from experience and share best practices
- Evaluate the contribution of policies and actions toward broader GHG reduction goals
- Ensure NAMAs are cost-effective and that limited resources are invested efficiently
- Report on the GHG effects of policies and actions over time (for domestic or international purposes)
- Meet funder requirements to report GHG reductions from mitigation actions

Source: WRI's Policy and Action Standard

Generally speaking, impact assessment methodologies currently used for most transport project appraisals are already well placed to meet the MRV needs and a thorough impact assessment (Measurement) can be a powerful tool for effective policy making. Transport data collected to measure the impact of NAMAs can also improve future transport planning. At the same time, this information helps provide a better picture of the overall global progress towards reducing greenhouse gas emissions. Reporting on progress and impact is particularly relevant for NAMAs that seek international financial support, as donors are concerned with the effectiveness of their investments.

MRV is beneficial for three main reasons:

1. **MRV helps to understand the effectiveness of measures** and to improve the efficiency of their implementation (Monitoring & Evaluation). The impact of a NAMA is not only relevant for GHG mitigation; it also demonstrates a country's contribution toward meeting its development objectives.
2. **MRV shows donors what their funding has achieved.** It may be a requirement of donors to determine the impact of the support provided. In addition to the mitigation impact of policies, programmes or projects, the sustainable development benefits may also be part of bilateral MRV agreements between NAMA host countries and their financial supporters.
3. **MRV increases transparency** about climate change mitigation strategies and helps to share experiences internationally.

The following sub-section (2.1) explains the basic MRV concepts for NAMAs and how NAMA MRV relates to already established monitoring procedures. Subsequent sub-sections of the handbook provide guidance of each step of the MRV process, including the identification of impacts, how to set up a monitoring plan and how to assess GHG and other impacts of transport NAMAs step by step.

Table 2-2: MRV steps and useful tools

| | Steps | Tools |
|---|---|---|
| MRV | 2.2.1 Define MRV objectives | • Case Studies of TRANSfer partner countries<br>• Chapter 6, Guidance for NAMA Design on MRV of NAMAs (Chapter 6)<br>• GIZ MRV Tool |
| | 2.2.2 Identify effects of the NAMA and define boundaries | • Cause-Impact Chains |
| | 2.2.3 Develop a monitoring plan | |
| | 2.2.4 Measure NAMA impact | • Reference Document on Measurement, Reporting and Verification (MRV) in the Transport Sector[12] http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/<br>• Blueprints for MRV methodologies for transport NAMAs[13] http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/ |
| | 2.3 Report on GHG impact | |
| | 2.4 Verify GHG impact | |

[12] further referred to as MRV Reference Document
[13] further referred to as MRV Blueprints

## 2.1 MRV basics

**Results of this step:** Understanding MRV rationale, what to MRV and which types of indicators can be used.

Guidance for NAMA Design on MRV of NAMAs (Chapter 6), GIZ MRV Tool

Measurement, reporting and verification is part of everyday life: when we are seriously ill, we measure our body temperature, report it to the doctor and in some cases the doctor makes an independent measurement to verify our report. When we set goals, such as "I want to lose weight," we define indicators, which we can measure. However, many aspects that may be important to us, like happiness, security, or friendship, may not have quantitative indicators. Here it is only possible to make a qualitative assessment.

It is quite similar in the transport sector. Some key indicators can be quantified (e.g. travel speed, energy consumption, emissions, expenses) while other aspects need to be assessed qualitatively (e.g. passenger satisfaction). Quantitative indicators can be measured in units such as kilometres, litres or inhabitants. In order to measure qualitative indicators, it can be useful to design a scale (e.g. five levels from fully satisfied to unsatisfied) to allow comparison and determine average values. Both quantitative and qualitative assessments are important for good decision-making.

In the UNFCCC context, the emphasis of monitoring is on greenhouse gas (GHG) emissions[14], which are primarily responsible for global warming, including carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$) and short-lived climate forcers such as black carbon (soot). While there are great opportunities to reduce black carbon emissions from transport in the short-term, the biggest climate change mitigation potential in the transport sector lies in reducing carbon dioxide ($CO_2$).

**Box 12:**

**Black carbon**

Black carbon – a component of soot – is emitted through the burning of biomass (wood stoves and biomass burning, as well as natural wild fires), coal and diesel fuels. It is an important component of particulate matter, contributing to air pollution and leading to respiratory diseases like asthma and lung cancer. The World Health Organisation estimates that outdoor air pollution led to 3.7 million premature deaths in the year 2012 alone, of which almost 90% occurred in low- and middle-income countries (WHO, 2014). A less known fact is that soot also has a strong warming effect on the climate. In fact, it is the second largest man-made contributor to climate change. Soot warms in two ways:

1. Particles in the air absorb sunlight, generating heat in the atmosphere.
2. Winds transport soot particles to the arctic and the Himalayas, where they settle on ice and snow like a black blanket, stopping the reflection of sunlight. Instead, radiation is absorbed, increases melting of the arctic ice sheet and the Himalayan glaciers and further accelerates global warming.

In contrast to $CO_2$, which stays in the atmosphere over centuries, black carbon remains only for several weeks. Abating black carbon therefore has a short-term effect on climate change and an immediate effect on local air quality.

The main contributors to black carbon from the transport sector are diesel vehicles without particulate filter. This includes trucks, ships, rail, utility vehicles and construction machinery.

MRV requirements for NAMAs are different from already established monitoring methodologies and procedures that exist for national inventories or the Clean Development Mechanism (CDM; see table 2-3). In fact, there are no formalised UNFCCC rules, and any guidance given to date is either voluntary or based on donor requests if NAMAs are internationally supported. Consequently, there is a lot of flexibility when it comes to the design of MRV for transport NAMAs. Nevertheless it is helpful to understand the differences of NAMA MRV and other monitoring methodologies, and to learn from established procedures.

CDM projects generate carbon credits that can be purchased by other countries to offset domestic emissions. This means that for each carbon credit, buyer countries can emit an additional tonne of $CO_2$. Therefore, strict MRV rules have been developed by the CDM Executive Board (http://cdm.unfccc.int/Reference/COPMOP/08a01.pdf) to verify the exact amount of $CO_2$-equivalents reduced by a specific action. NAMAs have a much broader scope than the project-based CDM and accuracy requirements for MRV are not as high. Nonetheless, for some project-type measures, such as for BRT developments or fuel switch projects, suitable CDM methodologies may be used or adapted (Sharma/Desgain, 2013, p.22).

[14] Despite a focus on monitoring GHG emission impacts, MRV of NAMAs also includes monitoring the progress of NAMA implementation, impacts on non-GHG aspects of sustainable development and on the contribution to transformational change (see page 46 of section „what to MRV").

**Box 13:**

**Greenhouse gas emissions at a glance**

**Carbon dioxide ($CO_2$)** is a gas derived from the combustion of fossil fuels, which represents the bulk of anthropic GHG emissions (about 55%). Taken as the reference greenhouse gas, it has a global warming potential (GWP) of 1.

**Methane ($CH_4$)** accounts for about 15% of anthropic GHG emissions. Two-thirds of methane emissions result from human activities such as crop farming, the extraction of natural gas and prairie activities (pasture systems and tallgrass burning). The remaining third is of natural origin (fermentation of plant or animal matter). Methane's impact on climate change is 25 times higher per tonne than that of $CO_2$ and it has a global warming potential (GWP) of 25.

**Nitrous oxide ($N_2O$),** which represents 5% of anthropic GHG emissions, has a GWP 298 times greater than $CO_2$. The largest human-related sources of nitrous oxide are crop farming (nitrogen fertilizers), biomass combustion and industrial activities.

**Halocarbons** and other synthetic **fluoro compounds** (HFC, PFC and SF6) derive from human activities, as they do not exist in nature. They are used in refrigeration and cooling systems as well as aerosols. These gases account for 15% of GHG emissions and their respective GWP varies substantially (from 140 to 23,900).

Nearly 10% of GHG gases result from tropospheric ozone (03), i.e. the effect of solar radiation on other atmospheric pollutants, such as nitrogen oxide or carbon monoxide. Sources include human transport systems.

Source: Panorama 2009: Greenhouse gas emissions and the transport sector http://www.ifpenergiesnouvelles.com/content/download/67679/1470180/version/2/file/Panorama2009_07-Gas_emissions_transport.pdf.

For measurement, reporting and verification (MRV) of a country's national or sectoral emissions, elaborate rules and guidelines have been developed to set-up emission inventories. The purpose of an inventory is to gain an overview of all emissions in a sector, country or city.

Mexico City, Mexico; Photocredit: Carlos F. Pardo/2006

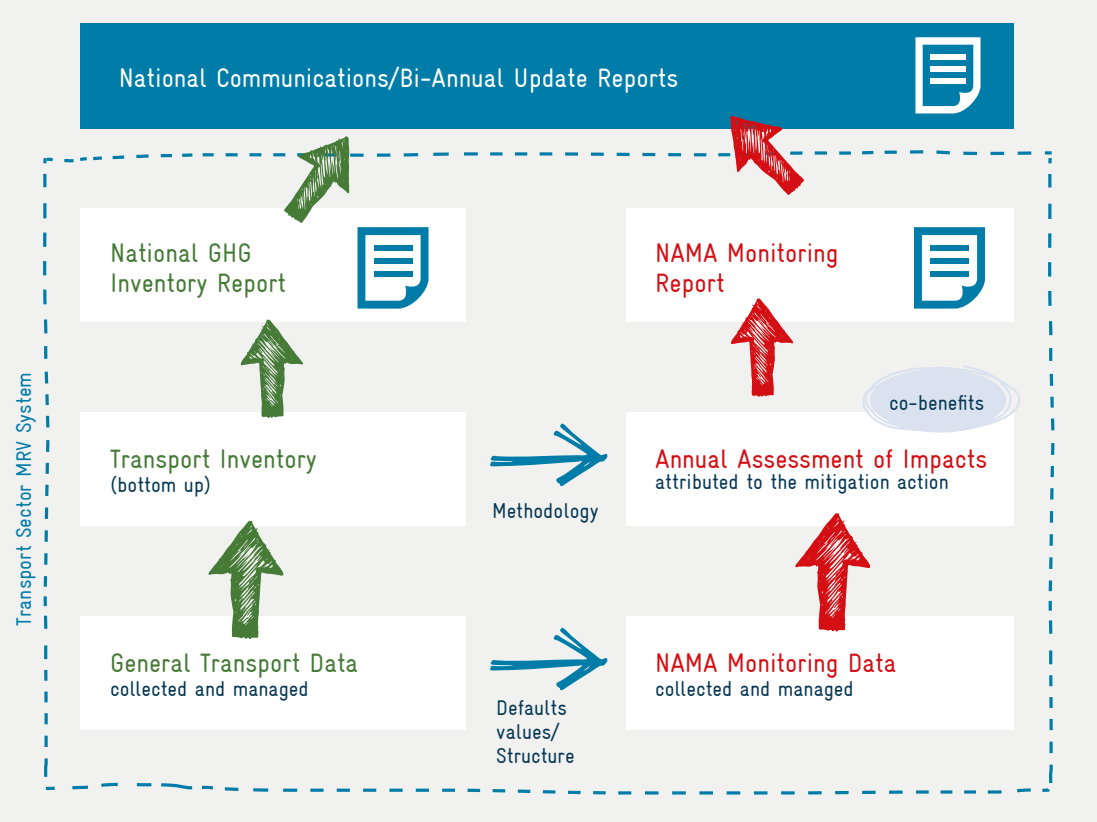
Table 2-3: Different MRV for different purposes (Source: Wuppertal Institute)

| Inventories | NAMAs | CDM |
|---|---|---|
| What is the status of emissions now and how have they developed over time? | What is the mitigation impact of a NAMA? | Exactly how many tons of $CO_2$eq were reduced by this specific project? |
| GHG inventories provide a snap shot of national (or urban) GHG emissions at a point in time and are normally aggregated by sectors. Time series of GHG emissions can give a historic GHG emissions trend of countries (or cities). Countries are encouraged to use more detailed data (called tier 3 in the IPCC guidelines) for estimating emissions with higher accuracy.<br><br>Inventories do not explain the reasons for changes in emissions (which could be due to economic development or successful mitigation actions). | MRV of NAMAs aims at estimating or measuring the contribution towards mitigation through policies, programmes or projects. Thus attribution to actions is important (in contrast to MRV of inventories).<br><br>There are no formalised rules on UNFCCC level. Any guidance given to date is fully voluntary or based on donor requests if NAMAs are internationally supported. | MRV rules for CDM projects are very strict to ensure high accuracy with respect to the mitigation impact. Methodologies are approved top-down on UNFCCC level to set a common framework, which allows offsetting or trading of certified emission reductions (CERs). |
| Inventories can deliver relevant information for identifying mitigation potentials in the NAMA selection process. This is especially true if emissions are attributed to specific users (e.g. vehicle types, or sub-national regions).<br><br>Data from inventories can inform MRV of NAMAs, depending on the type of NAMA as well as the level of detail of the inventory. | | CDM MRV methodologies may be helpful for some project-type measures. For policy NAMAs CDM methodologies cannot function as blueprints.<br><br>The CDM Executive Board has published two methodological tools for baseline establishment that can inform MRV of NAMAs. One is for modal shift in passenger transport and one is for modal shift in inter-urban cargo transport. |

Bangkok, Thailand; Photocredit: Dominik Schmid/2010

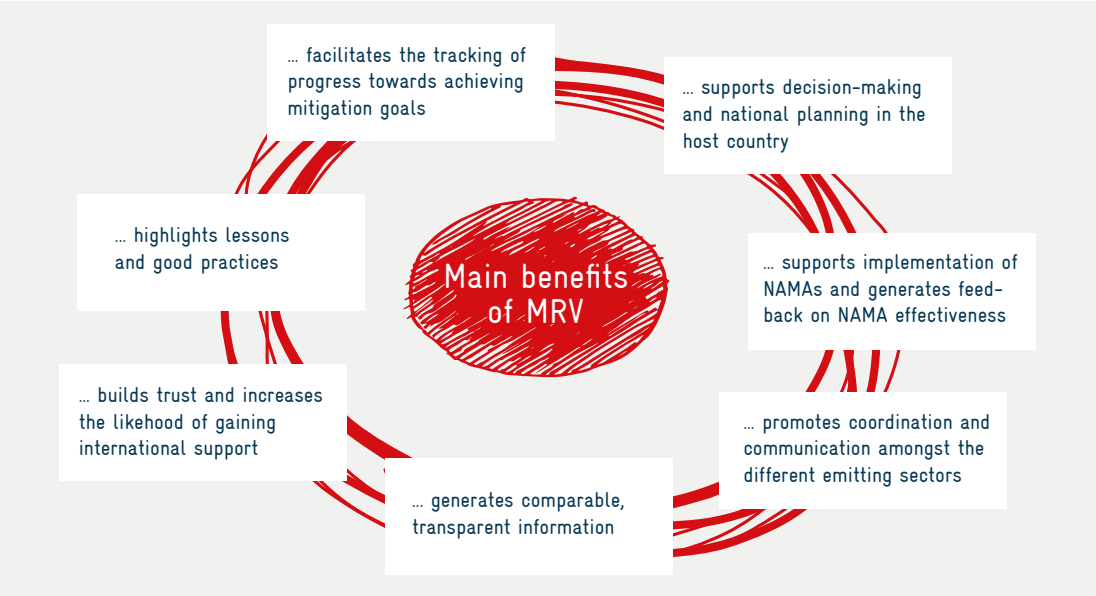
In contrast to inventories, the purpose of MRVing NAMAs is to assess the impact of an individual policy, policy package, programme or project. Nevertheless, data from transport emission inventories can be used for or linked to NAMA MRV, if inventories are built on bottom-up data based on transport activity, not only on overall fuel consumption data. The approach and values used for NAMA MRV should be consistent with national transport inventories, especially regarding the data structure (how data is organised) or country specific default values. Figure 2-2 illustrates how bottom-up transport inventories can interlink with NAMA MRV (see also section 2.1.5 in the MRV Reference Document for more details on GHG inventories).

Figure 2-2: Links between NAMA MRV and bottom-up transport inventories




Unlike national inventories or CDM projects, there are no fixed rules for MRV of NAMAs. This flexibility in developing an MRV concept allows for consideration of the local conditions and data availability, and the needs and expectations of the host country, NAMA developers or donors (which information should it deliver?). The main benefits of MRV are illustrated in Figure 2-2. The MRV approach of the "Road-Based Freight Programme" in Mexico illustrates how MRV has identified significant opportunities to improve the programme (see Textbox 14).

Figure 2-3: Main benefits of MRV




**What to MRV**

The impact assessment – the core element of a NAMA MRV process – is very similar to assessment, monitoring and evaluation processes that are already in place in many national and local administrations. While this handbook focuses mainly on measuring greenhouse gas emission reductions, it also touches on other sustainable development benefits that can be generated by a NAMA. The following sub-sections provide an overview of different MRV aspects to show the linkages between what is already being done in transport ministries and local administrations (regardless of NAMAs) and what is needed to turn an existing mitigation action into a NAMA.

Although NAMAs are strongly associated with reducing **GHG emissions,** other sustainable development benefits, such as productivity, air quality and health may be equally or even more important in a national context. Thus, MRV of **sustainable development benefits** may be of particular interest for national and local governments. A major benefit of the NAMA concept is the ability to give sustainable development objectives a more prominent role in the assessment of measures. Impact assessment of sustainable transport policies, infrastructure and operations measures has a long history and a variety of tools are already available (see sub-section 2.5). In several developing countries and cities, impact assessment and monitoring approaches are already more elaborate than required for estimating GHG emissions for certain transport specific impacts, such as local air pollutants or road safety. Such models can provide useful data and experiences for MRV of transport NAMAs. A few studies provide some MRV advice specifically for NAMAs (e.g. Cerqueira, 2012 and NAMA Partnership, 2013).

One specific criterion in supported NAMAs is the requirement of some donors, such as the NAMA Facility, to define, monitor and report the contribution to "transformational change" towards a sustainable low emission pathway that the NAMA aims to achieve, which should lead to large-scale emission reductions in the long term. The term "transformational change" stems from the understanding that a fundamental, structural change is needed to prevent dangerous levels of climate change and that NAMAs should have the potential to contribute to such a transformational change.[15] So far, however, there are no explicit requirements or rules as to how or with which indicators transformational change ought to be assessed. It therefore remains with the NAMA proponent to define suitable criteria and negotiate them with donors.

[15] The Green Climate Fund also shares this aspiration, by aiming to promote a „paradigm shift towards low-emission and climate-resilient development pathways" through the projects it will finance (GCF, 2015).

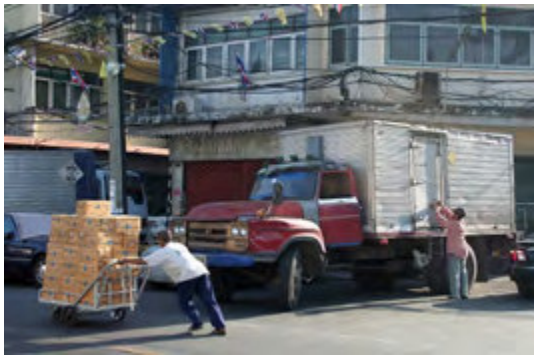
Nevertheless, some elaborations regarding characteristics of transformational change criteria in climate finance have already been put forth.

An introduction to transformational change in the climate change context is provided in the Guidebook for Climate Finance & Development Practitioners (Mersmann et al., 2014) and an associated paper on Design Criteria for Transformational Climate Finance (Mersmann and Wehnert, 2015).

During the implementation phase of a mitigation action, **progress needs to be monitored**, especially for internationally supported NAMAs, where donors may require periodic updates on implementation development. Thus, MRV of implementation needs to be negotiated with national institutions and donors who support NAMAs.

Finally, industrialised countries have an interest in accounting for the **climate finance** being provided to support developing countries in their mitigation actions. MRV of finance is very simple for an individual NAMA: received funds and general investments need to be accounted and reported.

Setting up institutions and effective processes to gather and aggregate climate finance data on a national level is an unsolved issue in many countries (Clapp et al., 2012). Indonesia has developed the Indonesian Climate Change Trust Fund (ICCTF) to facilitate climate financing (more information online).



Bangkok, Thailand; Photocredit: Dominik Schmid/2010

**Box 14:**

**Example 2: Outcomes of MRV of the Road Fright Transport NAMA in Mexico**

**MRV of the Road Freight Transport NAMA in Mexico identifies potential for policy improvement MRV findings included:**

1. There is a "perfect vehicle scrap age"
2. Among the different types of trucks the most significant mitigation potential lies in scrapping vehicle type C3
3. Fleet renovation is more effective than scrapping alone
4. Environmental impact of scrapping alone is relatively small
5. Environmental impact of fleet renewal with new trucks is significantly better than renewal with 3-4 year-old vehicles
6. Data needs to be collected and updated, but expenses for MRV approach in general are limited.

Recommendations based on these findings:

- Do not only focus on the scrapping; complement it with further measures (quality standards, driver trainings etc).
- MRV can be built and improved step-by-step.
- Increase incentive for scrapping; most scrapped vehicles are currently about 30 years old, because the incentive to scrap typically accounts for the value of a 30-year-old truck. However, the perfect scrapping age in Mexico would be between 10 and 20 years.
- Newly entering trucks must comply with most efficient technology available.
- When designing a vehicle scrapping programme, analyse the mitigation potential of different scenarios in advance to achieve high mitigation impacts through the incentive measures.

Table 2-4: What can be measured: an overview of MRV aspects (Source: Wuppertal Institute)

| | |
|---|---|
| **GHG emission reduction** | Assessment of<br>• direct emission reductions (quantitative)<br>• indirect emission reductions (mostly qualitative)<br>• contributions towards transformational change (qualitative) |
| **Non-GHG impact/sustainable development benefits** | Contributions towards sustainable and national development, such as local air quality or road safety etc. |
| **Progress of implementation** | Is the action (policy or project) on track?<br>Is progress being made according to plans and expectations? Where would adjustments be deemed necessary? Should finance/support by donors (domestic and international, public and private) proceed as planned? |
| **Climate finance** | Finance channelled towards sustainable development and GHG reduction measures implemented by a NAMA.<br>International and national climate finance data is easily available at the level of the individual NAMA – the challenge is to provide national processes and institutions which collect, aggregate and report information of all funding received. |

A step-by-step guidance and concrete examples for setting up national MRV systems can be found in the MRV Tool developed by GIZ, which is available in English, Spanish and French. Transport-specific information on national MRV systems can be found in the MRV Reference Document.


Jakarta, Indonesia; Photocredit: Stefan Bakker/2011

**How to MRV**

In order to quantify emission reductions of a NAMA, different types of indicators may be considered, including:

- **GHG-related indicators** describe a NAMA impact, which can be directly translated into GHG mitigation (e.g. reduced fuel consumption, reduced travel activity).
- **Transport indicators** describe changes in the transport system that are not directly linked to GHG emissions, but may serve as proxies to indicate the direction of change towards a low-carbon transport system (e.g. length of new railway lines, fuel taxes received, modal split).
- **Process indicators** describe activities that aim to initiate an emission reduction (e.g. implemented policies, regulation passed). Transformational change indicators may also be regarded as a category of process indicators (e.g. implemented policies, substantial changes in financial flows e.g. from road construction to public transport system expansion or improvement, institutional innovations).

A wide range of indicators best suits many transport NAMAs because they may not result in immediate, direct emission reductions, but may rather lead to indirect emission reductions in the long-term (e.g. fuel savings due to technical improvements can be quantified but the mitigation impact of non-motorised transport promotion can only be proven over the long term).

Depending on the nature of a NAMA and the data available, a combination of different types of indicators can be used to develop an MRV approach for both GHG mitigation effects and other sustainable development benefits. Huizenga and Bakker (2010: 55) assert: "Because of the huge costs of accurate data collection, as well as the variety in local conditions, the monitoring of GHG impacts in the transport sector lends itself to a mixture of actual calculation of GHG emissions reductions, indirect or proxy indicators and, in some cases, process indicators."

See also sub-section 2.2.3 for an example on indicators to MRV the sustainable urban transport programme in Indonesia (Box 16).

In order to define the right mix of indicators for a specific NAMA, the exact objectives of MRV need to first be explicit (what am I conducting MRV for and what information do I need to report to whom?). This is discussed in sub-section 2.2.1. Then, potential effects of the NAMA need to be identified and MRV boundaries set (sub-section 2.2.2). Once the effects of the NAMA that should be covered in the MRV approach are known, one can define an adequate indicator mix and develop a monitoring methodology and plan (sub-section 2.2.3). On this basis, the impact of NAMAs can be quantified (sub-section 2.2.4) and reported (sub-section 2.3). Sub-section 2.4 briefly discusses verification of GHG impacts. The last sub-section (2.5) provides a checklist and information on additional literature and tools on MRV of transport NAMAs.

Table 2-5: Different types of indicators for MRV of transport NAMAs (Source: Authors' compilation based on Huizenga and Bakker 2010)

| Different indicators for different objectives | Process indicators to monitor implementation and performance | | | |
|---|---|---|---|---|
| | implementation (change) and | performance (quality of change) | Output indicators regarding transport system changes | Outcome indicators regarding GHG emission reductions |
| What do they describe? | Progress on steps taken to implement a NAMA | Quality of NAMA implementation to ensure that the NAMA initiates a transformational change | Impact on certain conditions of the transport system or of the traffic situation achieved by a NAMA | Tonnes of abated $CO_2$ equivalent and subordinated indicators directly related to GHG impact to calculate emission reductions |
| Examples | • Policy or regulation passed<br>• Number of capacity building workshops organised or number of people trained<br>• Budget allocated and spent | • Cooperation between stakeholders is improved<br>• Demonstration projects selected based on an integrated urban mobility plan<br>• Implemented measures fulfil a certain standard, such as BRT Gold Standard etc. | • Kilometres of new bicycle lanes<br>• Number of newly registered vehicles with new fuel efficiency standard | • Carbon content of fuel<br>• Fuel savings of a fleet operator<br>• Changes in travel activity per mode |

## 2.2 Measurement

**Results of this step:**
**MRV objectives and boundaries are set. Effects of measures are identified and assessed. A monitoring plan is in place.**

**MRV Reference Document**
**http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/**

Similar to "traditional" impact assessments, an analysis of the emission reduction potential is a vital element for a NAMA. The following sub-sections introduce the required steps to define the boundary and approach to NAMA measurement and explain how emission reductions of transport NAMAs can be quantified.

Dhaka, Bangladesh; Photocredit: Santhosh Kodukula/2014

### 2.2.1 Define objectives of the MRV approach

**Case studies of TRANSfer partner countries**

Before starting to evaluate its (GHG) effects, a NAMA has to be characterised. This includes a general description of the NAMA and its measures, regional and temporal scope, main objectives, target groups and how the NAMA affects the target groups.

In order to develop a suitable MRV approach it is recommended to define the objectives of the GHG assessment. Having clear objectives is necessary to determine the required level of accuracy and completeness.

This sub-section focuses on GHG emissions, but the MRV framework should also cover sustainable development goals so that the objectives of the MRV concept include the contribution of a NAMA towards these non-GHG impacts.

## 2.2.2 Identify the effects of a NAMA, set MRV boundaries and decide monitoring methodology

**Identify impacts**

**Results of this step:**
List of impacts that should be measured, reported and verified.

**Cause-Impact Chains**
**MRV Reference Document, Chapter 3.1.2**

In order to estimate GHG effects of a policy or action, both intended and unintended effects of a NAMA should be taken into account. **A useful instrument to identify a NAMA's effects is to map a causal chain of how the mitigation action will lead to a reduction of GHG emissions and to other sustainable development benefits** (see Figure 2-4). The causal chain should include all expected effects, including both positive and negative and major and minor impacts. Mapping the cause-impact chain in a group can help facilitate a discussion between relevant stakeholders in order to create a common understanding of the adequate scope for MRV. It can also help to establish the adequate scope of the NAMA itself and helps to set the boundaries.

In order to identify the potential impacts of a measure, the cause-impact chain can help break down the NAMA into individual outputs/activities. Depending on the objectives of the MRV approach, the NAMA developer may include GHG effects as well as Non-GHG effects:

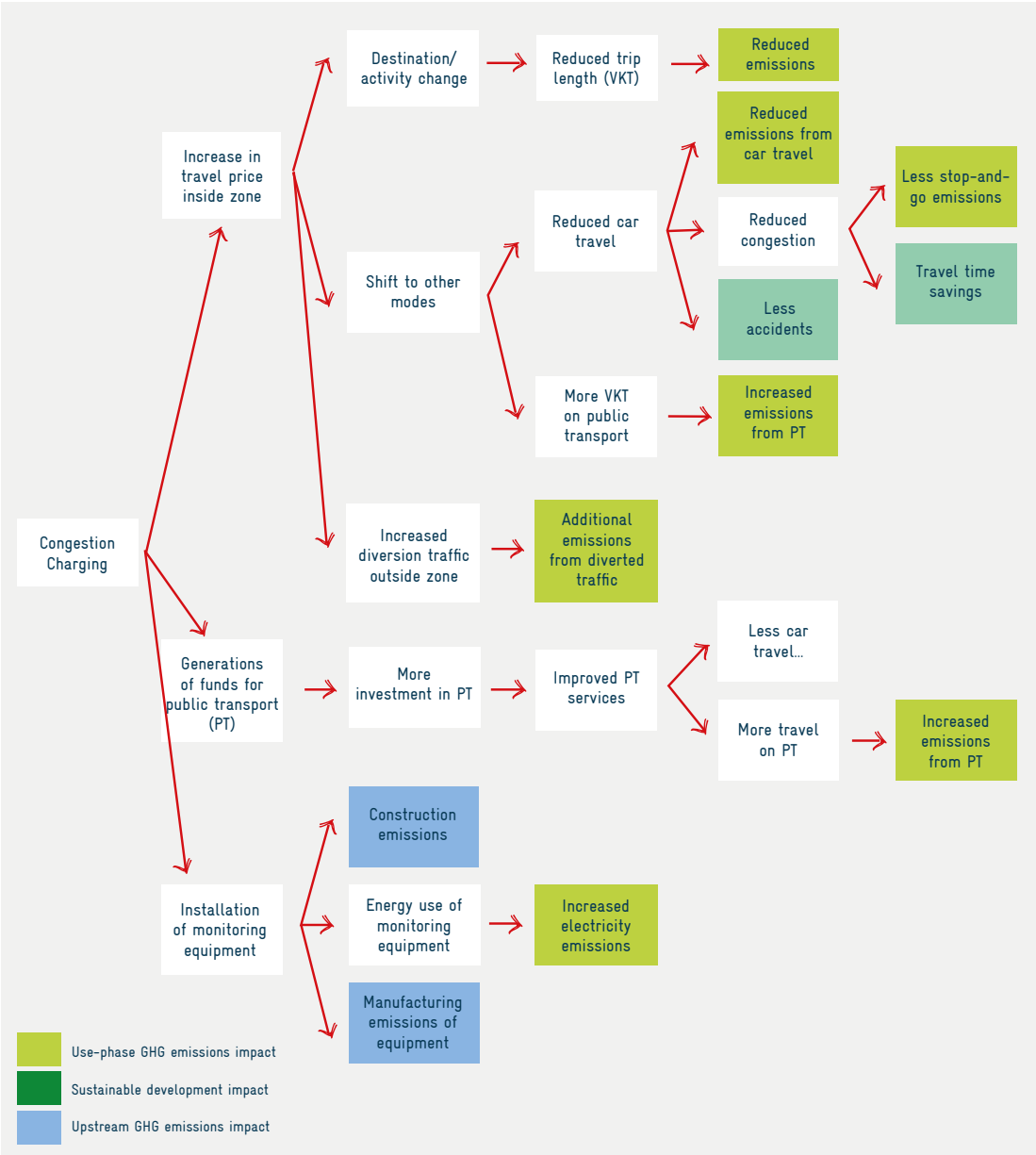
- Outputs: Deliverables that will be implemented within the scope of a NAMA (e.g. provision of incentives, implementation of an efficiency standard, infrastructure development)
- Intermediary effects: Changes in transport behaviour, vehicle technology, processes, or practices that result from the NAMA
- GHG effects: Changes in GHG emissions as a result of intermediate effects
- Non-GHG effects: Changes in environmental, social, or economic conditions

Further information how to develop cause-impact chains can be found in MRV Reference Document for Transport Sector Monitoring Systems (Chapter 3.1.2) or in WRI's Policy and Action Standard, Chapter 6.

Figure 2-4 illustrates an impact chain map for congestion charging for passenger vehicles, which could be part of a bundle of measures of an urban transport NAMA. Although not illustrated separately, emission reductions always also correspond to reduced travel-related air pollution.

Bogotá, Colombia; Photocredit: Gerhard Menckhoff/2005

Figure 2-4: Causal chain map for congestion charging for passenger transport (as part of a NAMA) (Source: own illustration)




### Define assessment boundaries

**Causal chains help to define the boundaries for MRV by assessing the identified effects according to their likelihood and relevance.** The relevance depends on the expected size of the impact, but also on the objectives of MRV (see more in the next chapter).

Important aspects for defining the assessment boundaries are the consideration of direct GHG effects within the regional and temporal scope of the measure, indirect GHG effects outside this scope, coverage of rebound effects and the assessed time period after implementation of the measure (please see Box 15 for definitions).

In order to decide which GHG effects are considered directly, and which indirectly, a definition of the scope is required. **The scope depends on the objectives of the GHG assessment** as defined beforehand, and the identified effects. Many measures cause strong short-term effects directly after implementation (e.g implementation of national speed limits). On the other hand, several measures will lead to a long-term mitigation impact only after the implementation of the NAMA. This is especially true for NAMAs that initiate a potentially transformational change (e.g. transit-oriented development policies or comprehensive sustainable urban transport programmes). In consequence, the time period has to be adequately defined for comprehensive assessments of short-term reactions, as well as long-term effects.

**Box 15:**

**Definition of different GHG effects of a NAMA**

Depending on the defined regional and temporal boundary, emission impacts can be distinguished as follows:

- **Direct GHG effects:** Effects on GHG emissions resulting from intended impacts of the measure, i.e. all concerned transport modes and mechanisms of action within the regional and temporal scope of the measure.
- **Indirect GHG effects:** Many measures do not only affect activity data or emission factors of transport activities within the regional and temporal scope of the measure ("in-jurisdiction"), but may also have indirect impacts on transport activities lying outside its scope ("out-of-jurisdiction"). For example, a car driving ban will reduce road traffic directly within the prohibitive zone, but it may cause indirect GHG effects due to diverted car traffic around the zone or an increase of public transport into the zone. These indirect GHG effects can partially offset the direct GHG effects, or they might amplify the GHG effects. Indirect GHG effects often relate to other transport modes and mechanisms of action than the direct effects.
- **Rebound effects:** So-called rebound effects are often overlooked, and can be of particular importance. For example, improved energy efficiency often reduces costs for the car user, which can induce additional travel that can partially offset efficiency gains.

To define the boundaries of the GHG assessment using causal chain maps, it is necessary to estimate:

- The **likelihood of each GHG effect** occurring, ranked at one of five levels (very likely, likely, possible, unlikely, very unlikely).
- The **relative magnitude of each GHG effect,** distinguished between three levels from major (>10%) to moderate (1%-10%) and minor (<1%) with regard to the overall impact of the NAMA. This assessment can be done based on rough estimations.

The following approach may be considered as an indication when defining the boundary:

Table 2-6: Decision matrix for which effects to be included in the NAMA boundary

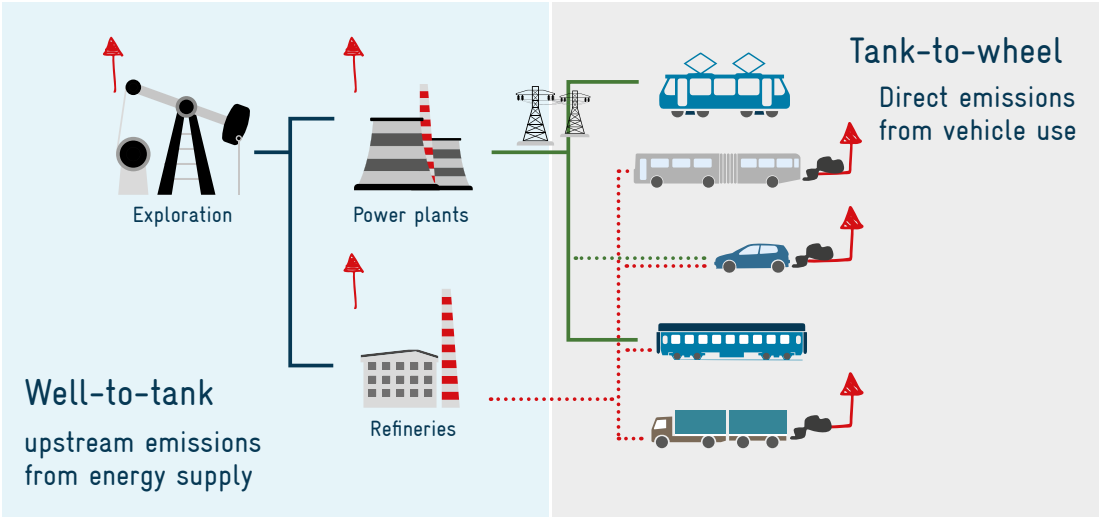
<table>
<tr><th>Magnitude<br>Likelihood</th><th>Minor</th><th>Moderate</th><th>Major</th></tr>
<tr><td>Very likely</td><td rowspan="3">May be excluded</td><td colspan="2" rowspan="2">Should be included</td></tr>
<tr><td>Likely</td></tr>
<tr><td>Possible</td><td rowspan="3">May be excluded</td></tr>
<tr><td>Unlikely</td><td colspan="2" rowspan="2">May be excluded</td></tr>
<tr><td>Very unlikely</td></tr>
</table>

Depending on the MRV objectives, additional impacts may also be covered.

When carefully considering all effects of infrastructure investment NAMA types, **construction emissions** should be included in the causal chain map. Their inclusion in the MRV boundary, however, will ultimately be up to the NAMA developer. Clean Air Asia (2013) found that emissions from low-volume road and at-grade road construction are a small fraction of total lifetime emissions; whereas construction emissions from rail and metro projects are substantial when compared to at-grade roads (e.g. construction emissions of a metro project in Cairo equals 28 years of operation emissions). This may be an argument for including construction emissions of future metro projects in the emission assessment, but construction emissions of alternatives would then also have to be included.

**Setting the boundary should also define which part of fuel and vehicle life-cycles are considered in the assessment.** In the transport sector, analysis is often broken down into „well-to-tank“ (or „well-to-station“), and „tank-to-wheel“ (or „station-to-wheel“) emissions (see figure 2-4 below). The first stage, which incorporates fuel production, processing and fuel delivery (or energy transmission in the case of electricity) is called the „upstream“ stage, while vehicle operation itself is called the „downstream“ stage (California Energy Commission, 2007). Depending on the expected effects of a NAMA, it may be necessary to include the full well-to-wheel cycle. For NAMAs promoting the use of electric vehicles, there are no direct emissions from the vehicles, as all GHG emissions result from the upstream energy supply. Thus, complete well-to-wheel emissions should be considered in the GHG emission factors when assessing electricity-based transport.

Figure 2-5: Well-to-tank and tank-to-wheel emissions (Source: Ifeu, 2012)




Emission factors exist for different fuel types to calculate well-to-wheel and tank-to-wheel emissions; values also vary between different countries and regions due to fuel quality and fuel production. If upstream emissions are included, it is therefore recommended to apply the emission factor provided by the relevant national authority, such as the Environment or Energy Ministry.

Finally, the boundary also includes the temporal, sectoral and geographic scope of the NAMA (see Table 2-7 for a summary of the different elements that need to be defined to set the boundary).

Table 2- 7: Boundary elements that need to be defined

| Boundary elements | Impact Indicator |
|---|---|
| **Temporal boundary** | Direct indicators on GHG emission reduction |
| **Sectoral boundary** | Transport modes and activities covered |
| Territorial boundary | Geographic scope for which GHG emission reductions (and other impacts) are assessed |
| GHGs included | GHGs covered by the assessment, as well as whether upstream emissions are included or not |
| Sustainability effects included | List of the sustainable development impacts monitored |

Once the boundary is set, indicators for all effects covered by the boundary can be defined (see table 2-7 above and next sub-section) and a suitable methodology for the quantification of impacts can be chosen.

The choice of a particular monitoring methodology depends on the identified impacts to be covered and needs to strike a balance between accuracy, data availability and effort (depending on available resources).

## 2.2.3 Develop a monitoring plan

**Results of this step:**
**Monitoring plan and data collection requirements are in place**

**Responsibilities for MRV are defined.**

**MRV Blueprints**

Based on the MRV boundary suitable indicators to monitor the included effects must be identified so that a monitoring plan can be set up. The monitoring plan facilitates the process of annual monitoring and recording of the key parameters. According to the Guidance for NAMA design (UNFCCC/UNEP/UNDP, 2013) this monitoring plan should specify:

1. Assumptions and default values used and relevant data sources;
2. Frequency of monitoring and reporting of monitored parameters;
3. Description of data storage plan (e.g. use of existing Geo Information Systems (GIS));
4. Responsibilities of specific actors with regard to monitoring and reporting;
5. Methodologies used to calculate mitigation benefits;
6. Level of accuracy to be applied (e.g. scope of a survey).

**Identify key indicators for monitoring**

Adequate indicators have to be identified for each of the effects covered by the MRV boundary. Sub-section 2.2.4 describes which transport data is necessary to quantify the GHG emission impacts of transport activities. In addition to indicators for quantifying GHG emission impacts, MRV can also include measurement of implementation and further sustainability impacts as well. Since some GHG effects may only be possible to measure after the timeframe of implementation, it is important to inform national stakeholders and international donors about the progress of implementation.

Process indicators can involve relatively low effort and occur shortly after implementation. Measuring the impact of implementation is relevant to demonstrate how the NAMA contributes to the envisaged change process longer term. If a NAMA aspires to initiate a transformational change (e.g. formulated by the NAMA Facility), it should include indicators that demonstrate whether the NAMA is "on-track" towards achieving a transformational change.

Table 2-5 above already summarised which indicator types can be used to assess different effects of a NAMA. Beyond the GHG emissions mitigation effects, most transport NAMAs will likely lead to other benefits. These benefits contribute to sustainable development by supporting the economy (e.g. increase in number of jobs), environment (e.g. reduction in air pollution) and public health (e.g. less fatalities due to accidents).

In the interest of the host country, such sustainability benefits are recommended to be included in the monitoring plan and will thus help to increase transparency on the overall effectiveness of public spending. It is expected that this increases the attractiveness for potential donors and also supports domestic political endorsement.

Iquitos, Peru; Photocredit: Alejandro Garcia/2012

**Box 16:**

**Example 3: Indicators to MRV the Sustainable Urban Transport Programme in Indonesia**

The monitoring plan of NAMA SUTRI includes indicators to measure the progress of implementation (process indicators), the direct GHG impact, and the sustainability benefits of the NAMA. The GHG impact will be assessed at city level. In order to estimate the mitigation impact, annually monitored emissions will be compared against baseline scenarios developed ex-ante. Throughout the implementation of NAMA SUTRI, the data collected will be used to validate and update the assumptions made in the scenarios. This will give insights into emission trends and show the actual impact of the measures.

This approach will, however, not allow the attribution of the impact of a specific measure to emission trends at city level. Additional qualitative information will therefore be used to identify how specific measures contribute to a certain change (table 2-9). To reflect achievements of the whole programme certain indicators will also be assessed at the national level (see table 2-10).

Sustainability benefits are measured for specific measures on city level by the following indicators:

- Allocation of public road space for different transport modes
- Household spending on transportation
- Accessibility and quality of public transport:
  - Level of service (capacity and frequency) of public transport
  - Comparison of travel speed between different transport modes
  - Coverage and connectivity of the pedestrian network
- Air quality at main transport corridors

Public transport surveys, household surveys, traffic counts, and air quality measuring will be used as data sources.

Table 2-8: Indicators for GHG Impact at local level

| Parameter | Indicators | Data Source |
|---|---|---|
| **Transport Data** | | |
| City level | • Vehicle mileage<br>• Fleet composition/energy efficiency of vehicle fleet<br>• Modal share<br>• Motorisation rate (cars, motorcycles) | GHG inventory for transport,<br>Traffic surveys, household surveys, statistical data of the police |
| Measure specific | • Public transport capacity<br>• Specific indicators that indicate emission reduction (e.g. PT users, parked cars, PT occupancy rates, fuel consumption of new buses etc.) | Public transport survey |
| **Process Indicators** | | |
| City level | • Measures selected based on integrated urban mobility plan<br>• Quality standards for planning are applied<br>• Budget allocation<br>• Institutional cooperation for planning and data management | Annual report of pilot cities and the Technical Support Unit |
| Measure specific | • Capacity of local planners<br>• Capacity of local transport consultancies<br>• Upscaling of project is planned<br>• Documentation of high-quality project is available and promoted | Project monitoring survey by delivery organisation (GIZ), Technical Support Unit and the pilot cities |

Table 2-9: Indicators for GHG Impact at local level

| Parameter | Indicators | Data Source |
|---|---|---|
| **Transport Data** | | |
| Activity data | • Transport performance of different vehicle categories differentiated by vehicle size, age and fuel type (vehicle numbers, average annual mileage (VKT), and vehicle load rates)<br>• Passenger numbers of public transport | National vehicle statistics, trip surveys |
| Specific fuel consumption | • Emission factors by vehicle type and for different traffic situations<br>• Detailed data for the vehicle fleet (size, age, fuel type) | |
| **Process Indicators** | | |
| Allocation of funding | • Amount of funding allocated for SUT projects by the MoT | Annual budget plans of the MoT |
| Pipeline of projects | • Number of 'high-quality' project proposals seeking support | Project list of the technical support unit |
| Access to finance for SUT measures | • Programmes and funding schemes available | Published documents describing the funding mechanisms and how to access them |
| Support structures | • Consultancy services provided to local governments | Documentation of the Technical Support Unit |

Availability of quality data is crucial for the application of MRV. In any case, data will have to be generated, gathered and updated. These activities have a value beyond MRV; detailed and reliable data on transport characteristics is key for all kinds of transport policies and strategies, such as road safety and air quality enhancements. Valuable guidance on indicator choice for policy making and planning is available from the Victoria Transport Planning Institute (http://www.vtpi.org/wellmeas.pdf).

In most cases MRV of NAMAs will require setting up a data collection process. This process should build on existing structures and processes as much as possible, but it is unlikely that all required data would be readily available. Such activities can be costly and time-intensive, and might need additional expertise e.g. on the most suitable monitoring and data collection methodology. Therefore, data collection processes should be considered along with the technical support provided by partnering developed countries in the context of a supported NAMA. In the future, climate-technology centres[16] might be in a position to provide support in terms of capacity building in the context of multilaterally supported NAMAs.

Finally, it is important to reiterate that the stringency of the MRV approach will largely depend on requirements defined by the financing partner. Nevertheless, the methodology for the estimation of mitigation effects of transport NAMAs must suit the specific needs and conditions of the host country.

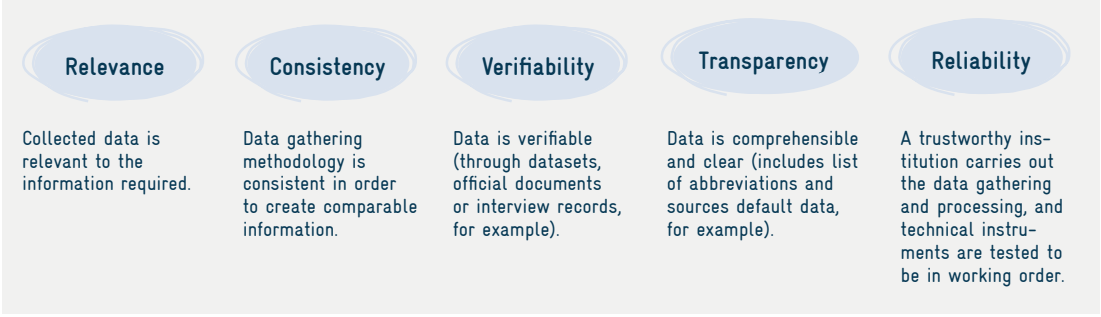
### Identify data needs

The availability of transport data in developing countries varies from one to the other. A basic distinction can be made between data that is routinely monitored through enforcement and regulation (e.g. vehicle registration by type of vehicle, fuel or technology; odometer readings as part of annual vehicle inspections), data that is surveyed on demand for monitoring and evaluation of policy and planning (e.g. average frequency of busses, average load factor, passenger load vs. capacity), other institutionalised data, such as official household surveys (e.g. vehicle population, trip length, travel speed, trip mode share) if available and data that is gathered ad-hoc (e.g. in research projects). Very often methodologies are not harmonised and data is not shared between different public and private institutions involved in gathering different types of data. MRV planning should take these factors into account and include procedures that encourage cooperation between different institutions. Especially where NAMAs encompass national level policies or programmes, data collection, data sharing and management can be integrated into the policy or programme design from the beginning, making MRV easier during implementation.

[16] The Climate Technology Centre shall facilitate a network of national, regional, sectoral and international technology networks, organizations and initiatives with a view to engaging the participants of the Network in the field of Technology development and transfer. For more information see: http://unfccc.int/ttclear/templates/render_cms_page?TEM_ctcn

In order to ensure a certain level of data quality, the following five factors that contribute to high quality date should be observed:

Figure 2-6: Factors that to contribute to high quality data




Nevertheless, a lack of data or poor data quality should not be viewed as a barrier for NAMA development. The MRV process can be improved over time and contributes to improved transport data availability and quality, paving the way for better policy making in the future.

### Define Responsibilities

Clear responsibilities for MRV are necessary to ensure efficient and reliable processes for data collection, quality control and management, as well as emission calculation and reporting. The monitoring plan should therefore assign clear mandates to organisations participating in the development and implementation of the NAMA.

For national NAMA oversight across sectors, a Central Coordinating Unit may be required to (UNEP Risoe 2013) :

- incorporate reporting from all line ministries and their regulatory bodies, and keep an updated registry of relevant policies and projects;
- report financial flows to policy schemes from both national and international sources (e.g. the Green Climate Fund), including actual disbursements;
- collaborate with the line ministries and record the effects of regulatory initiatives compared to the baseline.

Manila, Philippines; Photocredit: Christian Mettke/2014

## 2.2.4 Quantify the GHG effects of a NAMA

The previous sub-sections showed how to identify the effects of a NAMA and the related indicators that should be measured, reported and verified in the chosen MRV approach. This sub-section describes how to quantify the GHG effects of a transport NAMA.

**Ex-ante and ex-post**

As mentioned in the introduction, quantifying emissions in the transport sector is not only required to assess the impact during and after implementation (ex-post), but also to estimate the likely impact of an intervention before it is implemented (ex-ante).

It is very common to work with scenarios in order to estimate the effect of individual policies and actions in advance. This is especially important for NAMAs that avoid emissions relative to a baseline scenario but do not necessarily lead to absolute reductions in emissions (see sub-section on baseline estimation further below for more details). In this case the impact may not be visible in the GHG inventory (see figure 2-7).

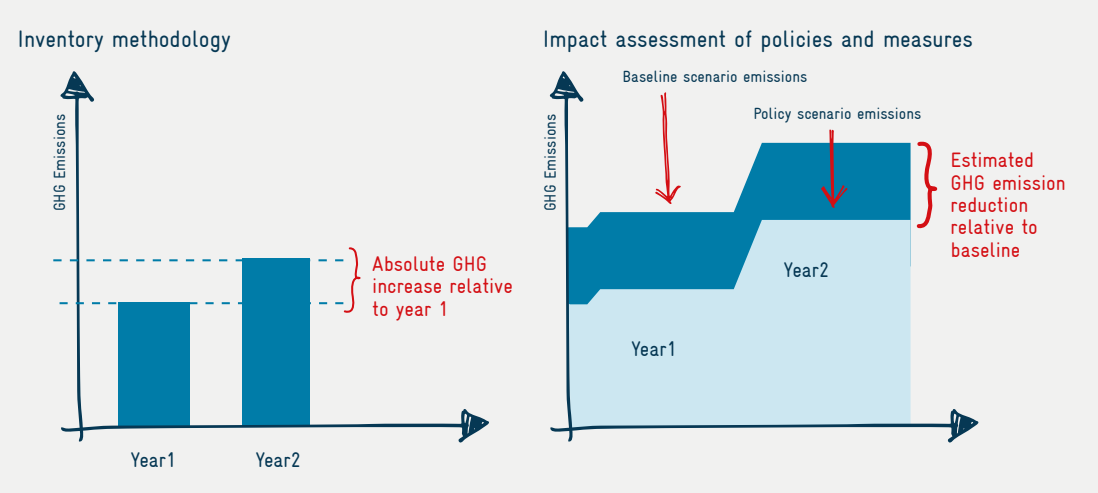
The following figure illustrates the different methodologies for inventory and NAMA accounting:

**Results of this step:**
**GHG impact is estimated.**

**MRV Reference Document on Monitoring Systems for the Transport Sector**
http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/

**MRV Blueprints**
http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/

Figure 2-7: Comparison of methodologies for GHG assessment (Source: WRI: GHG Policy and Action Standard; June 2014)




It may be necessary to develop different scenarios in a NAMA impact assessment that describe the development of emissions with or without the implementation of the NAMA. Scenarios are often used for measures or policies, such as urban transport programmes or policy regulations, which have an impact that cannot be easily isolated and attributed to just one intervention due to interferences of other policies or developments (compare Box 16 on the MRV approach of the Sustainable Urban Transport Programme in Indonesia and Box 18 on the ex-ante Business-As-Usual (BAU) scenario of NAMA SUTRI). If the impact of a NAMA can be directly attributed to one specific intervention, such as improvements in the efficiency of the vehicle fleet, the BAU scenario is straightforward: The only parameter that needs to be changed compared to calculating NAMA emissions is the emission factor. If there is no change in the overall travel activity, it may even be sufficient to compare fuel consumption and related emissions before and after the intervention (inventory methodology). As a rule of thumb, it is recommended to keep the assessment simple yet solid. Increasing complexity also leads to more assumptions on future developments, which adds uncertainty to emissions calculations.

For a more detailed discussion of baseline scenarios see chapter 3.1.4 “On the concept of BAU scenario” in the MRV Reference Document.

The purpose of ex-post evaluation is to assess the mitigation impact of a NAMA during and after implementation, which a) can help to adjust the project/policy to maximise the mitigation impact (along with other objectives) and b) provides information on achievements that can be communicated to administrations, donors and the public.

In order to obtain comparable information, it is im portant to use consistent data and methodologies for both ex-ante and ex-post assessments. In some cases, however, an improvement of the input data or me- thodologies might be possible over time to achieve better results. This could be the case for instance if a country introduces a comprehensive travel survey that provides better input data. In such situations, the more accurate data should be used, but reporting must be transparent about this change and try to assess the impact of the changed input data compared to earlier years.

The following table summarises the difference between ex-ante and ex-post approaches.

**Box 17:**

**Scenarios – instruments to assess the mitigation impact of a transport NAMA**

- A NAMA scenario describes developments and effects expected or caused by a NAMA. It includes the effects of the measure, and also other interacting or overlapping policies and actions and general development trends (non-policy, e.g. socio-economic drivers).
- The baseline or business-as-usual scenario describes what would most likely happen in the absence of the NAMA.

The net GHG effect of the evaluated measure is the difference between the emissions forecasted in the NAMA and the baseline scenarios.

Table 2-10: Comparison of ex-ante and ex-post assessment

| | Ex-ante impact assessments of NAMAs | Ex-post impact assessments of NAMAs |
|---|---|---|
| Definition | ...estimate the expected future GHG effects resulting from the policy or action. | ...determines the (GHG) effects of a policy or action by comparing real emissions development based on observed data to baseline emissions describing the situation without intervention. |
| Purpose | To estimate the expected effects of a policy or project before its implementation as a basis for decision-making.<br>This information matters for national decision makers designing or choosing a NAMA, as well as for donors who select a NAMA from a number of proposals. | The ex-post assessment provides transparency about the actual impacts of a NAMA compared to the expected impacts in the baseline scenario.<br>This information is important for evaluation and adjustment of a mitigation action and for monitoring progress. |
| Considerations for implementation | It is often difficult to clearly attribute a certain development to the impact of a NAMA since there can be several interferences and synergies within the transport system. In order to increase the transparency of these uncertainties it is important to<br>a) use the same boundaries and methodologies for ex-ante and ex-post assessment<br>b) validate the ex-post assessment with additional references (e.g. expert interview, passenger survey) | |
| Example: | Evaluation of the implementation and effects of EU infrastructure charging policy since 1995<br>http://ec.europa.eu/smart-regulation/evaluation/search/download.do?documentId=10296156 | |

**Box 18:**

**Example 4: Ex-Ante: Assessment-Mitigation Potential of the Urban Transport NAMA in Peru**

The Sustainable Urban Transport NAMA in Peru (TRANSPerú) covers six measures, including the introduction of efficient technologies and the qualitative improvement of public and non-motorised transport. In a first attempt to quantify the GHG mitigation impact of the six measures a possible mitigation effect in the range of 2.2 to 4.3 $MtCO_2$, accumulated over the period of 2012 to 2022, was identified. Please note that only parts of the measures were considered and the final potential will be higher.

**MRV Reference Document**
http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/

The estimation follows a bottom-up approach and is based on the creation of three scenarios (BAU –pessimistic – optimistic), where the Business-As-Usual scenario reflects a mere continuation of current political efforts, while the other two scenarios are based on different assumptions regarding their respective level of ambition. The BAU scenario represents the baseline against which the pessimistic and optimistic scenarios are compared.

The six measures, included in the NAMA, cover a broad spectrum in terms of geographical scope, characteristics and data availability. Two clusters reflecting similar characteristics were formed, for each of which a different methodology was applied. For the capital region, given better data availability, the following calculation approach was adopted:

$$\text{Emissions} = \text{No.of persons} * \sum_{i=1}^{n} \text{no.of trips} * \frac{(\text{P} - \text{km})}{\text{trip}} * \frac{\text{Veh} - \text{km}}{\text{P} - \text{km}} * \frac{\text{EFi}}{\text{Veh} - \text{km}}$$

Where i refers to the respective transport mode, P-km/trip is the average distance of a person trip, Veh-km/P-km reflects the inverse of the occupation rate of the vehicles, and EFi/veh-km reflects the emissions per transport mode and kilometre.

Given the lack of data, a simpler approach is applied to measures being implemented outside of the capital area:

$$E = Veh * VK * EF$$

Where VK refers to the average vehicle-kilometres and EF to the average emission factor for all vehicles.

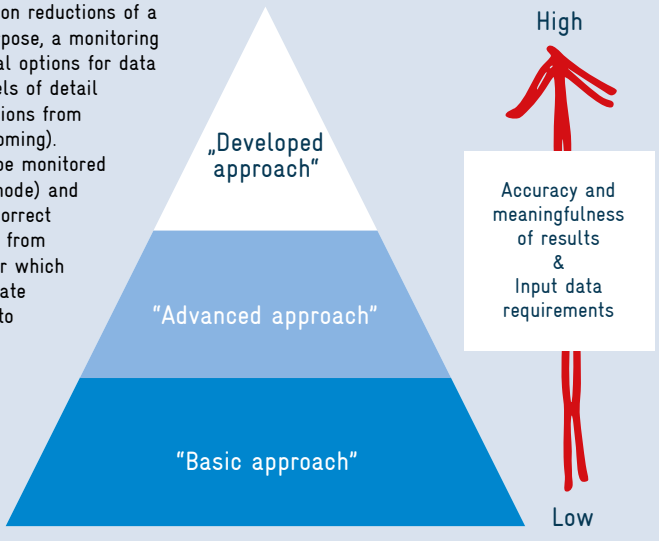
**Box 19:**

**Example 5: Ex-Post: Monitoring transport emissions in Chinese cities**

In China, the GIZ Sustainable Transport Programme on behalf of the German Ministry for Environment, Nature Conversation, Building and Nuclear Safety cooperates with several Chinese cities to improve their transport emission accounting. To assist in this, the European handbook Emission Factors for Road Transport (HBEFA), was adapted for Chinese traffic situations, resulting in a Chinese emission factor data set for road transport. Similar adaptation is now also planned for other Asian countries. The matching emission model (HBEFA-China expert version) is applied to calculate both current transport emissions and future policy scenarios. It can also be used for monitoring.

A detailed description of the methodology behind HBEFA-China can be found in the technical paper "Modelling Energy Consumption and GHG emissions of road transport in China"

In this context, GIZ cooperates with the World Bank in the northern Chinese city of Harbin to monitor the emission reductions of a GEF project using HBEFA-China. For this purpose, a monitoring guide is being developed that include several options for data collection and data sources at different levels of detail (Guide on "Monitoring greenhouse gas emissions from transport activities in Chinese cities" forthcoming). The two main data categories that need to be monitored annually are travel demand (total VKT per mode) and changes in fleet composition (to apply the correct emission factors). The levels of detail range from basic calculations with defaults (level A) for which only rough data is needed, to a more elaborate calculation called "good practice" (level B) to very detailed calculations based on disaggregated data titled "best practice" (level C). HBEFA-China can be used for all three approaches. It thereby provides consistency across different aggregation levels and allows improvement over time without a need to change the methodology.



## Estimate Baseline Emissions

As mentioned earlier, it is necessary to understand what would have happened in the absence of a policy or project in order to estimate its GHG effect. The baseline, or business-as-usual scenario, is a reference case against which the NAMA implementation case is compared.

Baselines can be either static or dynamic. A static baseline means that assumptions made at the start of the project (e.g. on the composition of the vehicle fleet, motorisation rate etc.) remain constant – the baseline is only calculated once. A dynamic baseline, on the other hand, reflects changes in various macroeconomic factors and policies over the course of the project life – the baseline is calculated several times and always adjusted to real-world developments regarding socio-economic and policy developments with each monitoring cycle. Therefore, dynamic baselines are more accurate than static baselines.. For NAMAs that have a longer monitoring period (more than 5 years), **it is recommended to use dynamic baselines that allow for adjustments throughout the monitoring period.**

Among other factors, the following parameters may be considered for adjustment in a dynamic baseline:

- Trends in motor vehicle ownership and use
- Composition of the motor vehicle fleet
- Changes in fuel quality
- Changes in vehicle technology and emission factors
- Transport mode shares
- Changes in public transport patterns
- Changes in trip lengths

Proper estimation of baseline emissions is a critical step, since it has a direct and significant impact on the estimated GHG effect of the NAMA. Baseline establishment partly relies on political negotiations involving different interest groups, private sector stakeholders and academia regarding the assumptions on future developments. The key assumptions should ideally be agreed upon by a broader group of stakeholders.

In any case, baseline establishment must account for other on-going or planned activities to avoid double counting. NAMA developers may decide on one of the following options to avoid double counting:

a) If different NAMAs or other policies and measures are relevant within the same boundary, NAMA developers must consider other NAMAs, policies and measures in the baseline scenario.

b) NAMA developers may decide to monitor the whole bundle of NAMAs within the boundary.


Manila, Philippines; Photocredit: Ko Sakamoto

**Box 20:**

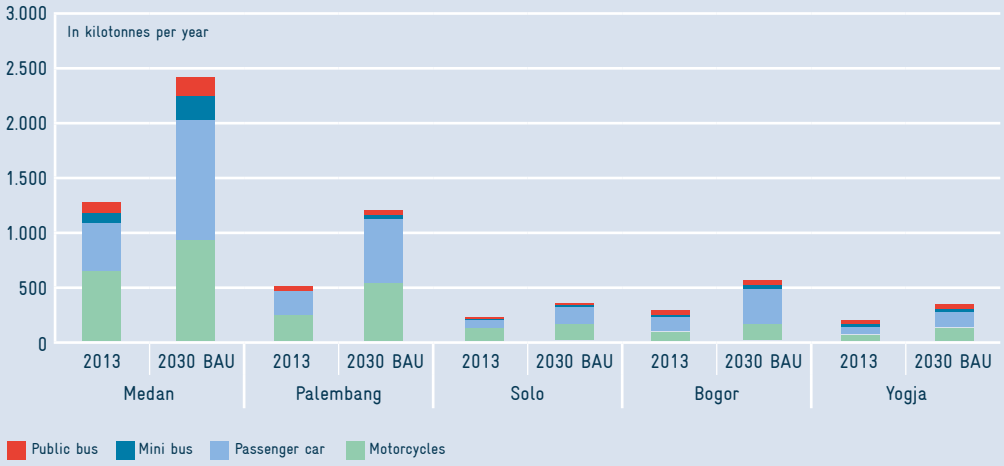
**Example 6: Ex-ante business-as-usual scenario NAMA SUTRI**

Between the base year 2011 and the target year 2030 key developments reflected in the BAU Scenario of NAMA SUTRI are population growth combined with increased motorisation. For most cities, a high increase in the number of passenger cars (PCs) is assumed. In addition, it is assumed that motorcycles (MCs) will have the highest share in overall vehicle numbers in the target year (2030). The BAU Scenario for the NAMA SUTRI further assumes an increasing demand in individual transport performance (Pass.km) compared to 2013, as well as a modest increase in bus size and fuel efficiency.

In 2013, the $CO_2$ emissions from passenger transport in the cities ranged from 185 kt $CO_2$ in Yogya to 1,264 kt $CO_2$ in Medan. In all cities, individual transport with passenger cars and motorcycles caused the highest share of $CO_2$ emissions. Despite assumed fuel efficiency gains (10% lower fuel consumption in l/km for all vehicle categories) transport-related $CO_2$ emissions will increase roughly by a factor of 2 until 2030 in the BAU scenario due to the growing vehicle population and transport demand.

**$CO_2$ emissions from passenger transport in the pilot cities**

Figure 2-8: Passenger transport $CO_2$ emissions of the pilot cites in 2011 and 2030 (BAU)




There is no regulation on the process of setting up baseline scenarios for NAMAs. For project-type mitigation actions, the CDM methodological tools provide guidance for baseline setting for mode shift in cargo and passenger transport. For other NAMA types, it is recommended to refer to studies and evaluation reports of policies and programmes implemented worldwide. The UNFCCC Secretariat is also currently compiling a Baseline Compendium that will give an overview of existing approaches and methodologies for baseline setting, including in the transport sector (due to be published by the end of 2016).

**Calculate the NAMA impact**

The NAMA impact estimation considers those effects that have been identified in the causal-chain map and selected to be included in the assessment boundary. Depending on the nature of a NAMA, efforts to quantify its emission impact can vary largely.

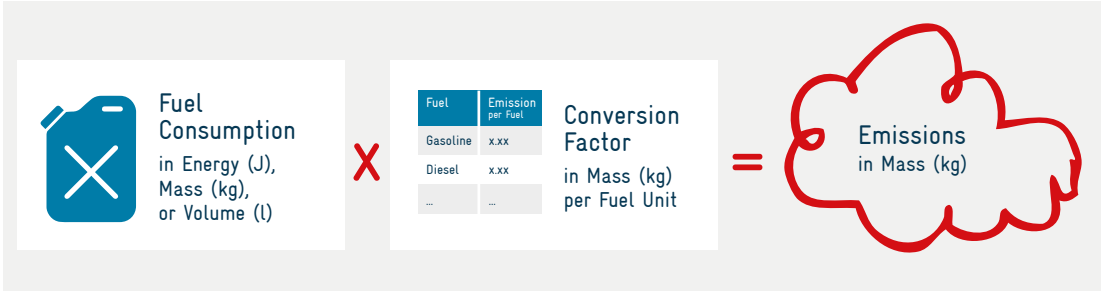
**Top-down and bottom-up aproach**

GHG emissions from the transport sector are mainly caused by the combustion of fuels. In principle, transport emissions can be estimated based on two independent sets of data – "fuel consumed" and "vehicle kilometres travelled", also called the top-down approach and bottom-up approach, respectively (2006 IPCC Guidelines for National Greenhouse Gas Inventories).

**The top-down approach uses the energy consumption of a country or region as a data basis.** In the transport sector, the key information for the top-down approach is fuel sales or fuel consumption. Especially for public transport or logistics fleets, operators usually hold fuel consumption data. The top-down approach is often applied to monitor emissions in the transport sector over time in emission inventories for national reporting.[17] Top-down data can also be used to assess the emission impact of NAMAs if the NAMA leads to a significant impact in a regional or national inventory or in the fuel consumption of public or private fleets. Top-down data may therefore be relevant for sectoral policies, such as fuel efficiency standards or economic instruments e.g. fuel taxes.

Transport emission calculation using the top-down approach is often considered to be more reliable than the bottom-up approach, as the number of assumptions and the complexity of data requirements are smaller. However, a top-down approach is associated with other uncertainties, such as fuel adulteration, the use of fuel for non-transport purposes such as diesel generators and stationary machinery, and fuel smuggling, i.e. fuel purchased in one country and used in another. Uncertainties are particularly high for diesel and LPG fuels since those are used for stationary purposes, too. In addition, data on fuel consumption does not provide any insights on the specifics of a transport system, such as the main fuel consumers and characteristics of motorised modes. Therefore, bottom-up measurements are required to assess the impacts of policies and measures and to attribute changes in emissions to changes in the transport system and mobility behaviour. Ideally, top-down data can be used to validate and crosscheck bottom-up calculations and vice versa.

Figure 2-9: Cross-check bottom-up calculation




Jakarta, Indonesia; Photocredit: Andrea Henkel/2013

[17] National Communications and Biannual Update Reports (IPCC Methodology).

**Box 21:**

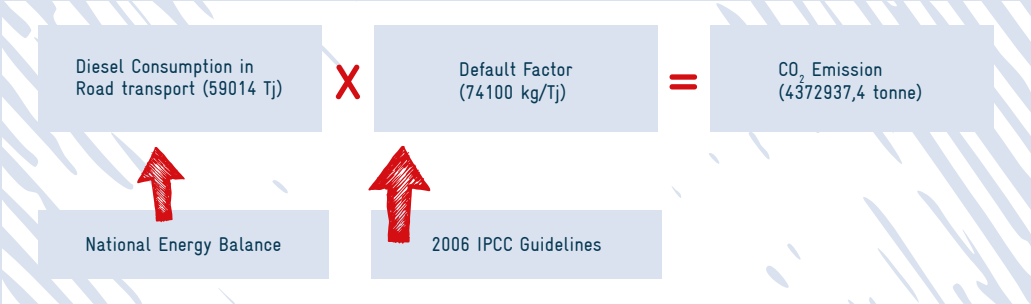
**Example 7: Tunisian GHG inventory (Road Transport, 2010)**

The methodology for calculating emissions for the Tunisian GHG emission inventory is based on the 2006 IPCC Guidelines. Consequently, road transport emissions appear in the energy sector and belong to the emissions from mobile combustion. The emissions are estimated according to the tier 1 approach of IPCC guidelines.

Table 2-11: Data on fuel consumption, emissions factors and data sources in the Tunisian GHG inventory

| | Data | Data source |
|---|---|---|
| **Fuel Consumption** | Consumption of Diesel (59014,3 Tj)<br>Consumption of LPG (1479 Tj)<br>Consumption of Gasoline (20955 Tj) | National Energy Balance<br>Ministry of Industry<br>National Energy Observatory |
| **Factor** | Emission factor (kg/Tj) by Fuel (CH4, N2O, $CO_2$, ...) | IPCC guidelines 2006<br>National Agency of Environmental Protection<br>Air pollutant Emission Inventory |

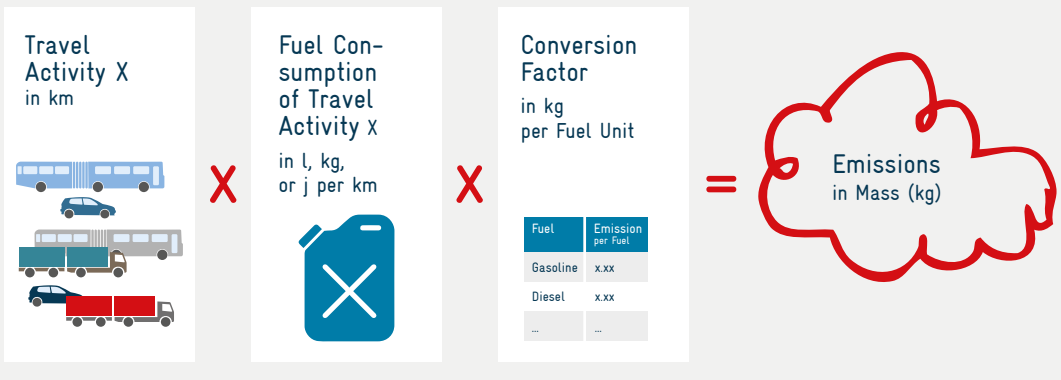
Figure 2-10: Example of top-down estimatation of $CO_2$ emission due to diesel consumption




**The bottom-up approach** uses transport activity data in combination with specific emission factors to calculate emissions. In the transport sector, the main parameters are:

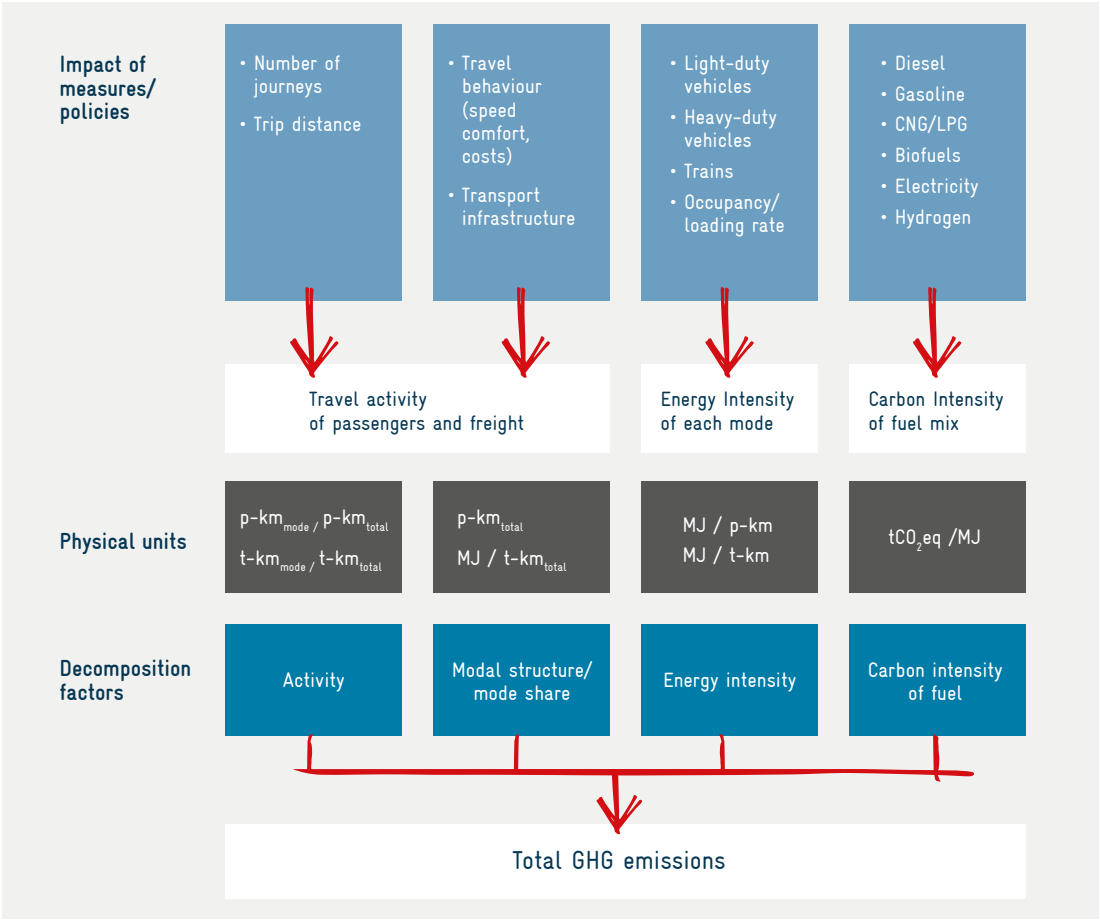
- **Transport activity:** characterized by vehicle kilometres travelled (VKT) or transport performance (passenger-kilometres, ton-kilometres) of different vehicle types.
- **Specific emission factors:** GHG emission per transport demand (e.g. $CO_2$/veh. km), depending on the specific final energy consumption of individual vehicles and on the specific GHG emissions of the final energy carriers used.

Figure 2-11: Calculation of emissions



This aggregated illustration can be further broken down into the ASIF framework (Schipper et al, 2000) – the most commonly used approach for bottom-up calculations of emissions in the transport sector, in which the total emissions are the product of the transport activity, modal structure, energy intensity, and fuel mix (see Figure 2-12).

Figure 2-12: Approach to describe the GHG emissions from transport (ASIF) (Source: adapted from Schmied; INFRAS)




To estimate the emission impact of a measure, or package of measures, these four elements have to be assessed:

- **Activity:** Does the measure lead to reduced travel activity compared to the baseline scenario? Reducing motorized transport activity data, measured in VKT, directly reduces energy consumption and GHG emissions (e.g. by reducing trip distances or avoiding trips completely). An increase of vehicle load factors will also reduce VKT, though transport performance (e.g. passenger km) remains constant.
- **Structure:** Does the measure lead to a modal shift of passengers or goods? Shifting of transport demand to low-emitting transport modes (e.g. freight from road to water) reduces activity data of those emission sources with high emission factors. Instead, activity data of emission sources with lower emission factors increase.
- **Intensity:** Does the measure lead to an increased energy efficiency of passenger or freight transport? GHG emission factors can be reduced at first by improving energy efficiency of the vehicle fleet (introduction of more fuel-efficient new vehicles, improved operating conditions of the vehicles) and, thus, lowering the specific energy demand.
- **Fuels:** Does the measure lead to a different carbon content of the fuel used for transportation? Switching to alternative drive concepts (e.g. natural gas, electricity) affects energy efficiency as well as specific GHG emissions per energy demand.

The GHG calculation has to be done separately for each emission source affected by the measure. Usually, each particular transport mode (cars, trucks, subway, passenger train, inland vessels, etc.) can be handled as an individual emission source. For modal-shift measures from cars to public transport, for example, an aggregation of different public transport modes (bus, subway, regional train) to one single emission source with an average emission factor might be appropriate, depending on data availability. However, other levels of differentiation may be required in some cases; a measure to promote alternative car technologies (hybrid, electric, fuel cell) might require an additional breakdown of emission calculations of car transport based on engine technologies (GIZ, IFEU, 2014). A more detailed differentiation into sub-segments e.g. of passenger cars or buses based on vehicle size is also possible. The adequate level of aggregation depends on the objectives of MRV as well as on the data availability (see also figure 2-14).

**Box 22:**

**Example 8: Calculating Urban Transport Emissions for the city of Sfax, Tunisia**

Transport activities of freight and passenger transport within the territory of Sfax were considered as part of the city's efforts to balance their carbon footprint.

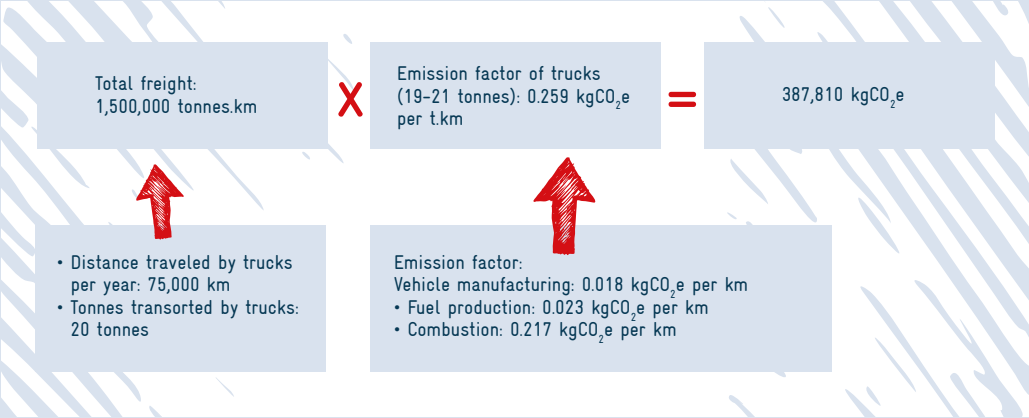
A summary of the data used in this methodology is shown in the following table:

Table 2-12: Data and data source for road transport, freight transport and emission factor in Sfax, Tunisa

| | Data | Data source |
|---|---|---|
| **Road transport (Passengers)** | Total distance travelled in vehicle-km<br>Breakdown by mode of transport | Municipality of Sfax |
| **Freight transport** | Freight volume in tones-km<br>Breakdown by mode of transport | Municipality of Sfax |
| Emission factor | | Data base of Bilan Carbone® |

Based on this approach road freight emissions were calculated as follows (example):

Figure 2-13: Example calculation of freight transport emissions in Sfax, Tunisia




In this case the emission factor also includes upstream emissions of vehicle manufacturing and fuel production.

**Box 23:**

**Example 9: Road Freight Activity Data, Mexico**

In the context of MRV activities for the Mexican truck scrapping scheme, data on the number of different trucks (C2, C3, T2 and T3), their fuel types, truck age, efficiency and km/year have been disaggregated. Data are used as entrance data for the GHG-emission calculator. The calculator is then able to compare the scrapped truck with a new truck (including transport activity) and, on this basis, calculate the annual and total mitigation of GHG-emissions. The calculator will be made available online at the end of 2015. The input data included in the calculator are only valid for the Mexican scrapping scheme, however, input data can be adjusted, so that the calculator can, in principle, be adjusted to other countries.

| | C2 | C3 | T2 | T3 |
|---|---|---|---|---|
| **Number of vehicles in 2013** | 75,293.00 | 64,582.00 | 2,276.00 | 238,390.00 |
| **Fuel Type** | >75% Diesel<br>>20% Gasoline<br>1% Gas<br>>1% Gas & Gasoline | >75% Diesel<br>>20% Gasoline<br>>1% Gas<br>>1% Gas & Gasoline | > 99% Diesel | > 99% Diesel |
| **Average fuel Consumption, total fleet (l/100km)** | 31.00 | 35.1 | 45.4 | 46.3 |
| **0-6 years** | 28.28 | 30.15 | 43.3 | 43.73 |
| **7-11 years** | 29.72 | 32.68 | 44.4 | 45.08 |
| **12-20 years** | 31.6 | 36.28 | 45.86 | 46.77 |
| **>20 years** | 38.42 | 35.26 | 50.27 | 52.16 |
| **Average KM, total fleet (km/year)** | 47,129.00 | 83,674.00 | 108,811.00 | 108,811.00 |
| **0-6 years** | 65,968.90 | 102,513.90 | NA | 127,650.90 |
| **7-11 years** | 55,692.70 | 92,237.70 | NA | 117,374.70 |
| **12-20 years** | 43,703.80 | 80,248.80 | NA | 105,385.80 |
| **>20 years** | 18,013.30 | 47,707.50 | NA | 72,844.50 |

Sources:

Ministry of Communication and Transportation, 2013

SEPSA "Diagnóstico sobre la Situación Actual del Sector del Autotransporte de Carga con un Enfoque Específico al Hombre-Camión y Pequeña Transportista", 2014

C2 = Number of axles: 2, Number of wheels: 6

C3 = Number of axles: 3¸ Number of wheels: 8-10

T2 = Number of axles: 3-5 , Number of wheels: 10-18

T3 = Number of axles: 4-6, Number of wheels: 14-22

As introduced in section 1, measures that can be developed into a NAMA can be categorised into four types, including strategies, policies, programmes, and projects. The methodology to assess the mitigation impact of a NAMA is directly linked to its type. The following table gives an overview of the different types of NAMAs and the measuring approach that is most applicable:

Table 2-13: Types of NAMAs and suitable measuring approaches

| Type of mitigation plan/action | Reporting format | Measuring approach | Further guidance |
|---|---|---|---|
| Low Emission Development Strategies (LEDS)[18] | National communications/ Biannual Update Reports | Top-down | IPCC Guidelines |
| Sector Strategy/sector target (national) | Transport Sector Inventory | Top-down/bottom-up aggregated | Report on GHG Reporting and Inventorying in Germany<br>MRV Reference Document (http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/) |
| Policies/Programmes | Monitoring & Evaluation Plan | Mix of top-down and bottom-up aggregated | MRV Blueprints (http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/) |
| Specific action or project | Monitoring & Evaluation Plan | Bottom-up detailed | MRV Blueprints (http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/) |

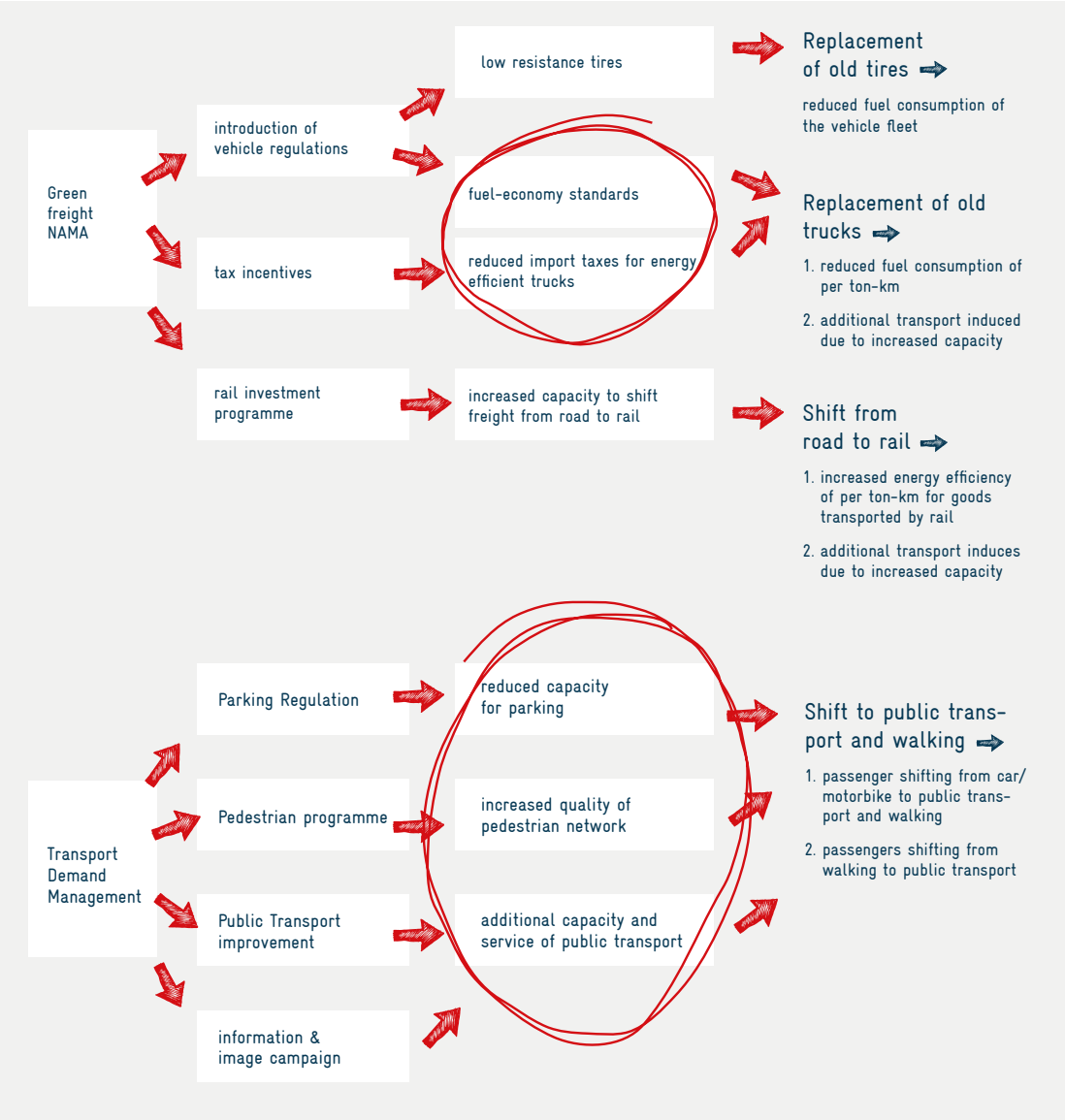
Due to the variety of possible NAMA types, the methodology to estimate the NAMA impact must be defined individually as appropriate and according to the system boundaries. In order to develop a solid methodology, it is recommended to involve transport experts who are experienced with the specific types of policies and measures. First examples for MRV methodologies for transport NAMAs can be found in the MRV Blueprints developed under the TRANSfer project.

For many transport NAMAs it can be useful to assess the impact of policy packages instead of isolated measures. In many cases a change in transport patterns or technology penetration results from a mix of different interventions (push and pull factors). It is up to the NAMA developer to decide on a reasonable combination of measures to be assessed comprehensively. The following figure shows two examples to illustrate how different policies and measures can be clustered into packages in order to assess their impacts.


San José, Costa Rica; Photocredit: Florian Kopp/2012

[18] LEDS are the general framework of a country's climate change policy.

Figure 2-14: Examples of packaging impacts for GHG assessment

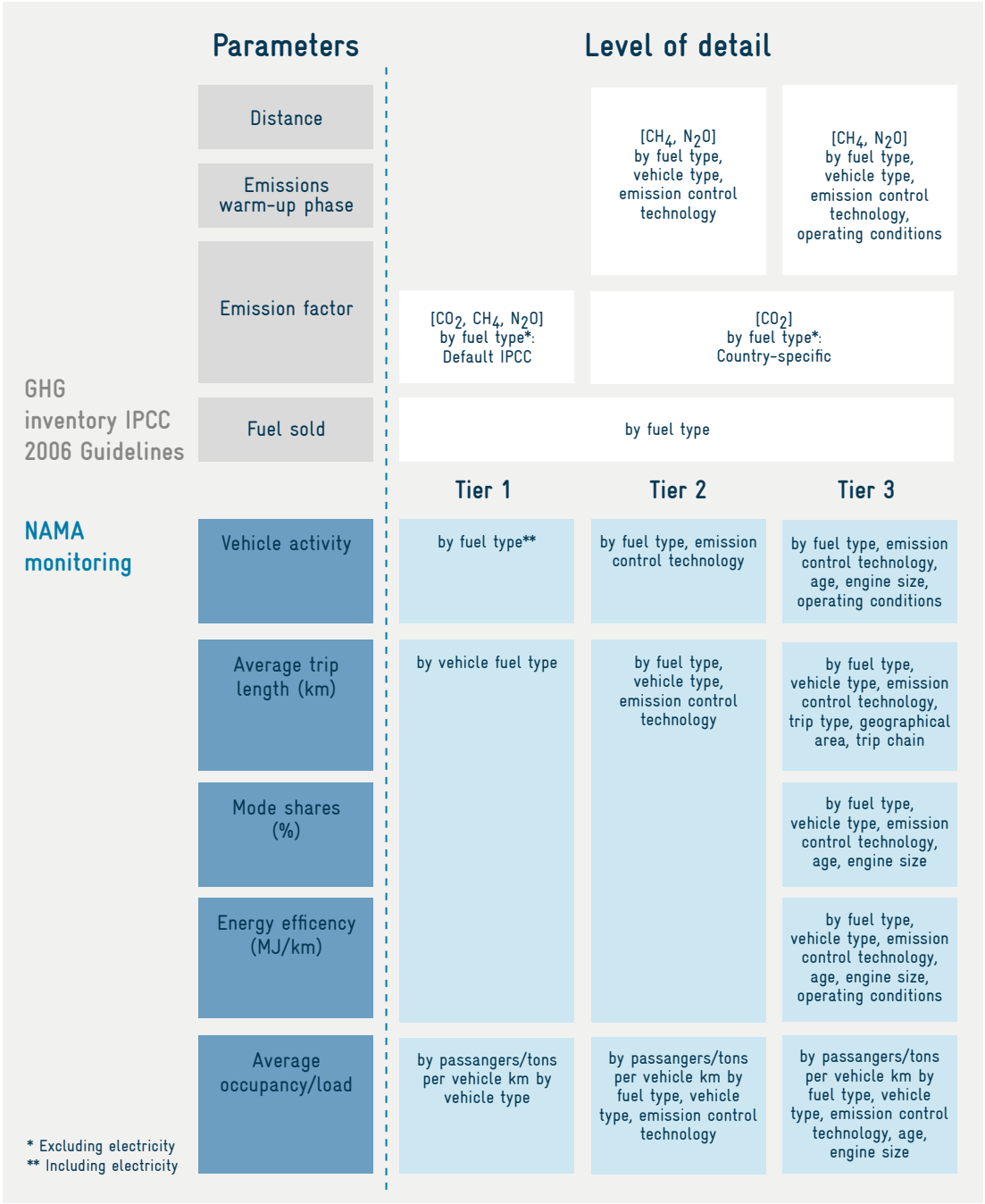



**Assess uncertainty**

All parameters for GHG emission calculations should be determined as accurately as possible to get the most reliable results on the real emissions development. However, data availability (type, quantity, quality, and resolution of data) is often limited. Capabilities to collect and process additional data are also restricted in most cases, depending on capacity, resources, and the level of expertise available to carry out the assessment. Consequently, simplified assumptions or rougher estimates may sometimes be necessary to determine the parameters needed for GHG emission calculations.

Different guidebooks recommend indicating the quality of assessment by determining a tier of assessment, which considers data intensity, resolution of analysis, and the level of accuracy of the evaluation. The IPCC introduced a tiered approach with rougher estimates where less accuracy is needed (or available) and more sophisticated methodologies when higher accuracy is necessary. This approach is used for inventory reporting under the UNFCCC and has been taken up by other guidelines such as the GHG Protocol or the Monitoring Guide for Chinese cities mentioned in Box 19. As illustrated in Figure 2-13, bottom-up calculations are also feasible if data availability is limited. Instead of detailed values for travel activity data (number of trips, specific emission factors, etc.), the calculation can also be based on average values for the region, where available. In any case, consistency of data is important for reliable results and comparisons.

Figure 2-15: Indicators at different levels of detail for GHG inventory and monitoring of GHG effects of NAMAs (Source: MRV Reference Document)



Unlike the CDM methodologies, which are defined by the UNFCCC, the accuracy of NAMA MRV methods can be defined by the national government and/or international donors (for supported NAMAs).

Apart from the MRV Reference Document, which describes the general approach towards transport sector monitoring, a first set of MRV Blueprints illustrates the MRV methodologies for shift to rail, truck scrapping, introduction and labelling of low rolling resistance tires and for urban transport programmes http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/. In addition, several tools are available that may help to approach the impact assessment, especially for project-type NAMAs, including:

- CCAP: Transport Emissions Guidebook and Calculator including policies on land-use, transit and travel demand management and vehicle technology and fuels. (http://www.ccap.org/safe/guidebook/guide_complete.html)
- TNT- UNEP: Toolkit for Clean Fleet Strategy Development (http://www.unep.org/tnt-unep/toolkit/index.html) A series of tools and guidance to outline practical and cost-effective solutions available to fleet managers, helping to assess the impacts of a fleet, and develop and implement a strategy to minimize emissions while improving fuel efficiency.
- ADB, ITDP, Clean Air Asia: "Transport Emissions Evaluation Models for Projects" (TEEMP) The TEEMP tools are sketch models that enable the estimation of emissions in both "project" and "no-project" scenarios and can be used for evaluating short to long term impacts of projects. The excel-based, free-of-charge spreadsheet models are mainly for project-type activities. If embedded default factors are used without adapting to local conditions, the accuracy of the calculation is typically not as high. (https://www.itdp.org/what-we-do/climate-and-transport-policy/transport-emissions-evaluation-models-for-projects/)

## 2.3 Reporting

**Results of this step:**
**Contents and procedures for reporting to the UNFCCC and donors (if applicable) are in place so that impacts and progress can be adequately conveyed.**

When designing an MRV system for NAMAs, it is important to first ask, "Who needs to receive what kind of information?" (see sub-section 2.2.1). Mitigation actions in the transport sector that qualify as a NAMA may need to be reported to three different audiences:

- domestic stakeholders, including the national government and general public;
- the UNFCCC; and
- any financial institution or donor that finances or supports a NAMA, including national banks, or international donors like the Green Climate Fund or the NAMA Facility.

Each of these audiences may require different information (Table 2-15). GHG emission reduction is certainly one key element, but some institutions may be more interested in other information. Costs typically rank high for national governments and financial institutions, while progress on contributions to sustainable development are of interest to national stakeholders, including the government, the media, the public and NGOs.

Bangkok, Thailand; Photocredit: Stefan Bakker/2014

Table 2-14: Reporting requirements for NAMAs (Source: Wuppertal Institute, adapted from Agarwal et al. 2013: 46)

| Forum "Who to report to?" | Objective "Why to report?" | Required Information "What to report?" |
|---|---|---|
| Domestic | Inform domestic planning and decision-making processes; respond to stakeholder demand | Based on objectives and standards of country. Impacts towards sustainable development could be of higher importance than estimation of emission reductions (ex-ante and/or ex-post) |
| International donor | Attract climate finance (ex-ante)<br>Account for successful implementation (ex-post) | Estimated emission reductions of NAMAs as well as costs & support needs are key elements in any proposal for NAMA support (ex-ante). Based on donor requirements, other impacts may also need to be included, such as contributions towards sustainable development, long-term & transformational potential towards low-carbon development, innovation ambition etc.)<br>Ex-post estimates and implementation progress reports are important during implementation to receive on-going finance. |
| UNFCCC NAMA Registry | Gain international recognition for efforts and potentially attract climate finance | Estimated emission reductions (ex-ante) are necessary, in addition to general information on the action and cost estimates. |
| UNFCCC Biennial Update Reports (BURs) | International reporting on efforts to address climate change | Information on NAMAs in design and implementation phases both have to be reported. In the design phase, the estimated emission reductions of each NAMA (ex-ante and ex-post) must to be provided. In the case of NAMAs already being implemented, information on current progress and impacts must also be reported. |

## 2.3.1 Reporting to the UNFCCC

The first mention of the term NAMA in an official UNFCCC document was the Bali Action Plan 2007.[19] It was immediately agreed upon that NAMAs should be MRVable, partly as the Parties to the UNFCCC want to gain knowledge on how GHG emissions could develop in the future. Thus, in addition to GHG inventories (information on historic emissions), countries should report on the activities they plan and implement to limit or reduce future emissions. Consequently, it was agreed that countries are requested to report on their mitigation actions within their Biennial Update Reports (BURs).[20]

In 2013, "general guidelines for domestic measurement, reporting and verification of domestically supported nationally appropriate mitigation actions by developing country Parties" were adopted.[21] However, these guidelines for NAMA MRV are fully voluntary and general in nature – the responsibility for implementation and monitoring of NAMAs lie with the host country. One reason for this is that NAMAs encompass a wide variety of possible actions, and a

**Box 24:**

Non-Annex 1 countries should report in their Biennial Update Reports on their mitigation actions. Specifically they should provide the following information in tabular format:

(a) Name and description of the mitigation action, including information on the nature of the action, coverage (i.e. sectors and gases), quantitative goals and process indicators;

(b) Information on methodologies and assumptions;

(c) Objectives of the action and steps taken or envisaged to achieve that action;

(d) Information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible;

(e) Information on international market mechanisms.

Source: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf

[19] Further information: Bali Action Plan
[20] General decisions on the content of biennial update reports were made in Durban, 2011: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf.
[21] Read more: Decision 21/CP.19 (Document FCCC/CP/2013/10/Add.2) available at http://unfccc.int/resource/docs/2013/cop19/eng/10a02.pdf

one-size-fits-all approach to MRV is not realistic. The primary objective is to engage countries on a broad scope of mitigation actions and not to limit NAMAs through rigid (and expensive) MRV regulations. The UNFCCC has recently clarified that both supported and domestic NAMAs will be MRVed domestically, but the supported NAMA also has to be MRVed through International Consultation and Analysis (ICA).

It must be reiterated that this handbook focuses only on strategy, programme, policy and project NAMA types. NAMAs constituting mitigation targets (e.g. 20% reduction by 20xx) are beyond our scope.

For policy and project NAMAs, we don't anticipate any strict, mandatory rules for NAMA MRV in the foreseeable future. Instead, a set of good practice standards is likely to emerge based on experiences gained in the current bottom-up process of NAMA development.

The responsibility for NAMA reporting lies within the national government, which must draft and submit the UNFCCC National Communications and Biennial Update Reports. In most countries this is a unit within the Environmental Ministry. However, the necessary data must come from transport experts, mainly within the Transport Ministry or other institutions charged with implementing NAMAs. Thus, the UNFCCC reporting requirements call for new or extended communication between departments and ministries of a country.

For further reading on the UNFCCC reporting requirements, we recommend the GIZ MRV tool, which gives an overview of the different MRV requirements within the UNFCCC process and has a dedicated section on MRV of NAMAs[22]. A more general guide to MRV under the UNFCCC was published by the UN Climate Change Secretariat in 2014.[23]

## 2.3.2 Reporting to donors

For internationally supported NAMAs, information must be provided to institutions that provide capacity development, technology or financial support. Estimates of costs and impacts (ex-ante) are part of any NAMA proposal. During implementation, information on the action's status will need to be communicated (e.g. length of railway lines built to date). During and after implementation, actions undertaken, costs and impacts will have to be documented (ex-post). This is similar to many grants or support given for transport measures in the past by development banks. The key difference is that donors also require information on the GHG impact of a NAMA. The kind of information requested varies from donor to donor and even from programme to programme. For example, the NAMA Facility, an early funder of NAMA implementation, requests an assessment of the impact of any individual NAMA on the greater transformation towards a low-carbon society, in addition to quantified GHG emission reduction impacts. At present, most donors do not have fixed requirements regarding the methodological approach towards MRV, but all usually require a mix of reporting on the status of implementation, the GHG impact and often also other sustainable development effects.

Many NAMA experts suggest that donor requirements on MRV for internationally supported NAMAs serve as good practice for NAMA MRV in general (CCAP, 2012). From these good practice examples, templates could be developed for UNFCCC reporting.

## 2.4 Verification

**Results of this step:**
**Information to support calculated GHG impacts and other reported sustainability benefits are available to verify NAMA achievements.**

Information reported to the UNFCCC or to international donors must be verifiable. It is not enough to merely claim that a NAMA reduces GHG emissions by x tons of $CO_2$eq – supporting information must be given so that an external reviewer can judge the validity of such claims. This includes a description of the methods used to calculate emission reductions, as well as key assumptions made. For example, to estimate the mitigation effect of a scrapping programme of old vehicles, it is necessary to make certain assumptions on the reduction in fuel consumption per vehicle and km, and on the average km travelled per vehicle per year.

Within the UNFCCC there will be a review process for Biennial Update Reports called International Consultation and Analysis (ICA). International donors will have a range of different auditing procedures, which they can apply to verify given information. It will be important to provide information on NAMAs and specifically their GHG impact in such a way that the quality of this information can be assessed and verified by external reviewers. This transparency is important to increasing the credibility of your NAMA.

[22] Read more: http://mitigationpartnership.net/mrv-tool-how-set-national-mrv-systems
[23] http://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/non-annex_i_mrv_handbook.pdf

## 2.5 Checklist and tips for further reading

The steps outlined in this section describe a standard approach to the development of an MRV concept. In reality, this process must be adapted to national circumstances and decision-making processes. Nevertheless, the steps of the process presented here constitute the key elements that enable successful development and implementation of a Monitoring, Reporting and Verification process.

| Checklist for MRV | ✓ |
|---|---|
| Objectives of the MRV approach are defined. | |
| Effects of the NAMA are identified (cause-impact-chain). | |
| Scope of the MRV approach is set (assessment boundaries) and MRV methodology defined. | |
| Data needs and collection methods have been identified and agreed by relevant stakeholders. | |
| Responsibilities for MRV have been assigned. | |
| A monitoring plan has been developed. | |
| Baseline emissions have been estimated and assumptions are agreed upon among relevant stakeholders. | |
| GHG Impact of the NAMA has been calculated (ex-ante or ex-post). | |
| Limitations of the GHG emission quantification are described (uncertainties). | |
| Sustainability benefits and process indicators have been assessed. | |
| Contents and procedures for reporting to the UNFCCC (and donors if applicable) are in place. | |
| Supporting information to verify the GHG impact can be provided. | |

Tips for further reading

### GIZ TRANSfer Project

- The Reference Document on Measurement, Reporting and Verification in the Transport Sector (MRV Reference Document) provides guidance on how to develop comprehensive and consistent national systems for monitoring transport related emissions, including monitoring or MRV of transport NAMAs. The document builds on existing knowledge and lessons learned in on-going NAMA activities and experiences in GHG emissions quantification in the transport sector in developed and developing countries. Available at http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/
- Blueprints for MRV methodologies for transport NAMAs (MRV Blueprints) will provide a concise description of MRV methodologies for different types of transport NAMAs, forthcoming. Available at http://transport-namas.org/measuring-reporting-and-verification-mrv-expert-group/

### Further GIZ sources

All sourcebook modules available online in several languages at http://www.sutp.org/en/resources/publications-by-topic/sutp-sourcebook-modules.html

- Report on GHG Reporting and Inventorying in Germany describes the methodology and institutional cooperation for GHG inventorying of transport emissions in Germany. Available at http://sustainabletransport.org/newly-released-report-on-ghg-reporting-and-inventorying/
- The MRV Tool provides developers and implementers of NAMAs with brief step-by-step instructions on how to develop a MRV-System. The tool navigates users to the relevant information, knowledge, instruments and publications available at http://mitigationpartnership.net/mrv-tool-how-set-national-mrv-systems

### Additional sources

### MRV of GHG emissions

- The WRI Greenhouse Gas Protocol - Policy and Action Accounting and Reporting Standard is a very detailed background document, which helps to design an MRV system for mitigation policies and actions. It spells out key principles and concepts related to MRV of NAMAs, specifically for top-down approaches. The Protocol was developed by World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The 2013 draft is available at http://www.ghgprotocol.org/files/ghgp/GHG%20Protocol%20Policy%20and%20Action%20Standard%20-%20Second%20Draft%20for%20Pilot%20Testing.pdf.

A *"Transport Sector Guidance"* is under development and will include a detailed overview of sector specific tools, methodologies and databases.

- IPCC has developed *"Guidelines for National Greenhouse Gas Inventories."* Chapter 3 of Volume 2 deals with "Mobile Combustion." Non-Annex I Parties are expected to use these for estimating and reporting their national GHG inventories. The guidelines also give insight on the *"tier approach"*. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
- The Transport Emissions Evaluation Model (TEEMP) Tool provides free-of-charge, easy-to-use, excel-based spreadsheet models that calculate $CO_2$ emission impacts of (mainly urban) transport projects. TEEMP encompasses a general emissions estimation manual, as well as project-specific emissions estimation tools for a wide variety of standard transport projects. The tool is designed to be usable with limited available data. TEEMP was developed by CAI Asia, together with ITDP, ADB, Cambridge Systematics and UNEP-GEF, and is available at https://www.itdp.org/what-we-do/climate-and-transport-policy/transport-emissions-evaluation-models-for-projects/. TEEMP is also at the heart of the GEF Manual for Calculating GHG Benefits of GEF Transportations Projects. Available at http://www.thegef.org/gef/node/4638
- World Bank has designed ROADEO (Road Emissions Optimization), a software programme for calculating GHG emissions at the planning, design, and construction phases. It includes a calculator user manual, and a report on GHG emissions generated by road construction and rehabilitation activities, which is classified by work categories and includes analysis of local and international best practices. Available at https://www.astae.net/publication/roadeo-%E2%80%93-road-emissions-optimization-toolkit-greenhouse-gas-emissions-mitigation-road
- Clean Technology Fund (CTF) co-financed operations in transport will be required to calculate GHG emissions reductions resulting from the investment. Therefore, CTF has published *"Guidelines for Calculating GHG Benefits from Clean Technology Fund Investments in the Transport Sector"*. Annex 3 in this document summarizes the guidelines to be applied in CTF co-financed operations. Available at http://www.slocat.net/sites/default/files/slocatfiles/contentstream/ctfresultsmeasurement.pdf

- UNEP has launched a cleaner fleet management toolkit that evaluates the impact of vehicle fleets on the environment, including climate change, and human health. It can also be used to develop and assess the impact of corrective actions. See http://www.unep.org/tnt-unep/toolkit/drivingstrategy/drivingclean.html
- Bongardt, D et al., (2013) *Low-Carbon Land Transport- Policy handbook.* Chapter 3.
- SLoCaT summarises more guidelines and provides corresponding links at http://www.slocat.net/?q=-content-stream/187/ghg-assessment-tools.

### MRV of non-GHG benefits

- IGES has been working closely with researchers at Nihon University in Tokyo, Japan and associated organizations in Thailand and the Philippines to develop a tool on co-benefits: *"Mainstreaming a Transport Co-benefits Approach: A Guide to Evaluating Transport Projects."* The guidelines or TCG, provide a set of user-friendly, step-by-step instructions for policymakers, transport planners, and development specialists interested in quantifying co-benefits of transport projects in Asia. Available at http://pub.iges.or.jp/modules/envirolib/upload/3209/attach/transport co-benefits guideline.pdf
- The United Nations University, Institute for Advanced Studies (UNU IAS) has developed a Co-benefits Evaluation Tool for the transport sector, which reports local air pollution. Available at http://tools.ias.unu.edu/sites/default/files/manual/Transport_Evaluation_Tool_Guidebook.pdf
- The A network called "COST 356 ,EST" focuses on the definition of a measurable environmentally sustainable transport, and aims to contribute to the development of methods to integrate environmental issues into the assessment and decision processes in transport planning and policy. Available at http://cost356.inrets.fr
- The World Health Organization (WHO) developed its Health Economic Assessment Tools (HEAT) for walking and for cycling. Available at http://www.heatwalkingcycling.org
- Todd Litman from Victoria Transport Policy Institute has done comprehensive research on how to measure sustainable transport policy, including the following topics: *"Reinventing Transportation; Exploring the Paradigm Shift Needed to Reconcile Sustainability and Transportation Objectives"* (http://www.vtpi.org/reinvent.pdf); and *"Well Measured: Developing Indicators for Comprehensive and Sustainable Transport Planning"* (http://www.vtpi.org/wellmeas.pdf).
- SLoCaT summarises more guidelines and provides corresponding links at http://www.slocat.net/?q=-content-stream/187/sustainability

### MRV of climate finance

- The Climate Finance Impact Tool developed by the Japanese International Cooperation Agency (JICA) covers various mitigation measures. A specific methodology sheet provides details on each calculation option. The formulas are implemented in ready-to-use excel sheets. For transport, guidance is given for railways (passenger & freight), mass rapid transit, monorails, light-rail and buses. The tools are available at: http://www.jica.go.jp/english/our_work/climate_change/mitigation.html

### Further guidance

- *Discussion Paper: Measuring, Reporting and Verifying Nationally Appropriate Mitigation Actions.* The objective of this paper is to identify issues for the MRV of NAMAs pertaining to key dimensions recognised in MRV literature and UNFCCC texts, namely: transparency, robustness and feasibility and cost-effectiveness. It pays particular attention to NAMAs with a supported component and reflects relevant experiences with developing NAMA proposals in selected countries http://www.mitigationmomentum.org/downloads/Mitigation_Momentum_MRV_Paper_JUNI2013.pdf
- Further information on the MRV concept for NAMAs can be found in the general publication *'Measuring, Reporting, Verifying. A Primer on MRV for Nationally Appropriate Mitigation Actions'* http://mitigationpartnership.net/sites/default/files/2012_unep_risoe_mrv_a_primer_on_mrv_for_namas.pdf

# Section 3

## Financing

# 3. Financing

## Introduction

Developing a financial structure for a NAMA is a key step in NAMA development. It entails questions on potential sources of funding and financing, financial mechanisms used, stakeholder involvement, financial and economic appraisal, etc.

The financial design of a mitigation action can be a challenging process. Experience has shown that many NAMA proposals developed in recent years have weaknesses with respect to the financial structure for implementation (NAMA Facility, 2014). Financial structures have either lacked sufficient detail, or were developed with too much detail, creating inflexibility in adapting to real demands of funders and investors (ECN & GIZ, 2014). At the same time, few international climate finance sources have been available to support a NAMA implementation. These are a few reasons why only a handful of NAMAs have moved to full implementation so far.

Working on the financial structure of a NAMA early on in its development process is key to moving a NAMA successfully from concept to implementation. Potential investors, funders and implementing agencies such as development banks and commercial financial institutions, ministries of finance and donors, national transport funds, etc., should be involved in the early stages of NAMA development, preferable when ideas for the potential financial mechanisms and scale and costs of the NAMA are first discussed.

This section of the Handbook provides some essential background information on transport finance (Section 3.2) and describes key steps in the development of a financial structure for the implementation of a transport NAMA, namely a context analysis (Section 3.3), identification of costs and revenue sources (Section 3.4) and developing the financial structure for a project based NAMA (Section 3.5) and for a strategy-, policy- or programme-based NAMA (Section 3.6). Finally, this section closes with a checklist and tips for further reading (Section 3.7). Unlike other sections of this Handbook, project based NAMAs are treated first, as it may be useful to understand the underlying financial characteristics of the investments that a strategy-, policy- or programme aims to incentivise.

| | Elements and Steps | Tools |
|---|---|---|
| Financing | 3.2 Context Analysis | Barrier Analysis |
| | 3.3 Identify costs and revenues | |
| | 3.4 Develop the financial structure of a project- based transport NAMA | Cost-Benefit Analysis, Sustainability Assessment, Financial Appraisal |
| | 3.5 Develop the financial structure for a strategy-, policy-, or programme-based NAMA | Expert consultancies, Financial flow chart |

Although the description of the steps may imply a consecutive order, the development of the financial structure requires an iterative approach in reality. For example one would do a rough, back-of-the envelop cost calculation in the scoping phase of the NAMA, which will need to be consecutively revised and detailed until a financial arrangement with funders and investors is reached. Moreover, not all steps are equally relevant for all types of NAMAs, and in some cases, some steps simply do not apply.

## 3.1 Basics of transport NAMA finance

In transport finance, especially when referring to the construction and operation of transport infrastructure and related services, a general distinction is made between funding and financing of transport measures (see Box 24):

**Box 25:**

**Defining "funding" and "financing"**

**Funding** refers to **revenue sources** of a project or to **other funding sources** (e.g. government subsidies). Funding sources can be described as income for a project that does not need to be paid back. Funding can be either short-term, one-off financial flows (e.g. through government grants), or long-term, mostly annual cash flows (e.g. from user charges). Funding sources include user fees and ancillary revenues such as advertising, land value capture, cost savings through reductions in fuel subsidies as well as subsidies and grant programmes from government and international donors. However, funding frequently relies on cash flows that are only generated during the lifetime of the project. Therefore, to support the upfront costs of the required investment, suitable financing mechanisms are required.

**Financing mechanisms** do not generate new revenues but leverage existing and/or future funding sources to pay for the construction or implementation of a project. In most cases, the implementing organisations of transport infrastructure projects do not have the required financial means for investments. This is why they often borrow additional funds, provided that the project is designed in a way that makes it attractive for investors. This financing, regardless of what mechanism is used, must be repaid in due course. The full or partial financing of an infrastructure project raises the total cost of the project; in the case of debt finance this is by an amount equal to the discounted value of interest payments. Box 26 describes different financing mechanisms relevant in the context of transport NAMAs.

When we talk about the development of financial structures for transport NAMAs in this section, we refer to the development of a structure that combines funding and financing mechanisms in a feasible, effective and efficient manner allowing for successful NAMA implementation.

Developing a financial structure for a transport NAMA is not a significantly different process than it is for other (sustainable) transport measures. Nevertheless, some points are specific to financing NAMAs compared to traditional transport measures:

- **International climate finance support:** Transport NAMAs have the opportunity to attract international climate finance for NAMA development and implementation, e.g. from funds which have a specific focus on NAMAs such as the NAMA Facility and the Green Climate Fund, as well as from climate related funds with a broader mitigation focus such as the World Bank´s Clean Technology Fund.
- **MRV:** NAMAs are subject to MRV of GHG emission reductions (see Section 2). Sound MRV systems help to understand the effectiveness of measures, encourage transparency and accountability, and show national government entities and donors what their funding has achieved. When developing the financing concept for a NAMA, sufficient resources need to be set aside for the implementation of the MRV system. This creates an added opportunity to invest in the improvement of monitoring data, which otherwise may not happen (GIZ (2014b)).
- **Inherent link between transport sector and climate policies:** In many cases, the development of a transport NAMA not only involves the transport sector, but is also integrated into national and international climate policy processes. Stakeholders from ministries of environment and climate negotiators tend to be involved in the NAMA development process alongside sector representatives from the national and subnational levels. NAMAs may get a high level of political attention in the context of climate policy, including additional international support for concept development. In managing the NAMA development process it is important to ensure the involvement of sector-specific funders and investors. In doing so, one needs to take into account local idiosyncrasy with respect to how the national public sector works and how it relates to decentralised authorities.
- **Innovative approaches and measures:** Transport NAMAs frequently include newer and more innovative measures (e.g. electric vehicles) or financial concepts (e.g. transport funds) that may be new to stakeholders in host countries. This may pose challenges to the development of suitable financial structures, as one cannot simply replicate well-known approaches.

Manila, Philippines; Photocredit: Christian Mettke/2014

Transport NAMAs include a wide range of different actions, ranging from sector strategies (e.g. a sustainable urban transport strategy), policies and programmes (e.g. a policy on fuel economy) to projects (e.g. a BRT line). The financial structure and the process of reaching agreement on the former vary widely for the different types of actions. Moreover, one NAMA may comprise different actions and hence require various financing approaches.

One major distinction can be made between project-based NAMAs and other types of NAMAs. In a project-based NAMA, the organisation developing and implementing it initiates or undertakes a direct investment or co-investment, e.g., in public transport infrastructure. In NAMAs based on sector strategies, policies and/or programmes, one generally aims to incentivise investments or behavioural changes by other parties through regulatory, planning, economic/fiscal, and/or communication- and information-based instruments (see Section 1, p. 2). Box 26 describes the financial structure of both a strategy- and a programme-based NAMA.

**Box 26:**

**Examples of financial structures of transport NAMAs**

**Sector strategy-based NAMA**: Sustainable Urban Transport NAMA – TRANSPeru

The centrepiece of the TRANSPeru NAMA is a sector-wide policy matrix. Various donors and the Peruvian government support the implementation of this policy matrix through funding and financing contributions. In the context of a NAMA Support Project financed by the NAMA Facility, the German development bank KfW will provide a Policy-Based Loan to the Peruvian Ministry of Economy and Finance. The disbursement of the loan will be linked to the fulfilment of outputs within the policy matrix. Although funds of a policy based loan are not attributable to a single measure ex ante, they are foreseen to fund specific investment projects, e. g. metro lines, urban transport in secondary cities, bicycle lanes and intermodal change stations, and support the preparation of others that will be funded directly by the government of Peru. These measures will be supported by a grant for technical assistance for improving the framework conditions, e.g. the development of fuel economy standards and a programme for secondary cities, and supporting institutional coordination and strengthening. Furthermore, the NAMA serves to leverage additional national and international financial resources for the implementation of the measures outlined in the policy matrix. In parallel, further concessional loans are planned for a metro in Lima and a new national programme for improving urban, public transport in medium-sized secondary cities. The Government of Peru contributes funds from its national budget for the implementation of the policy matrix. TRANSPeru is the first NAMA that uses a Policy-Based Loan as a climate finance instrument.

**Programme-based NAMA**: Transit-Oriented Development (TOD) NAMA, Colombia

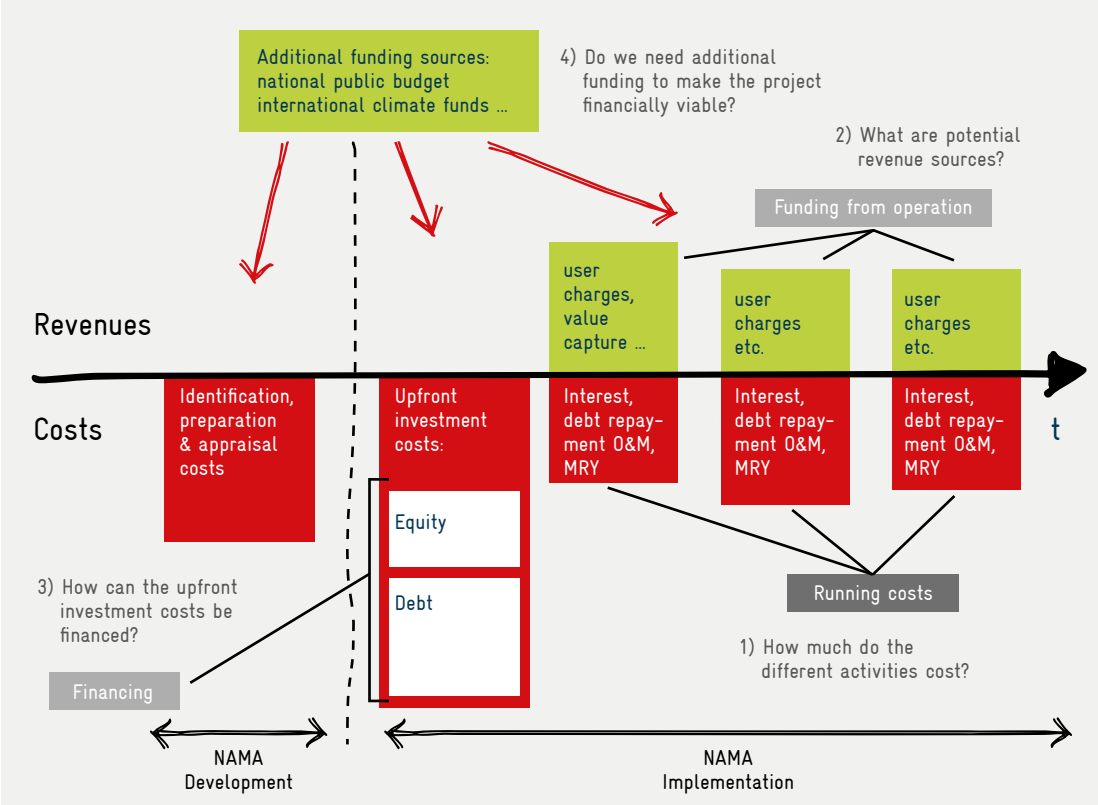
The Transit-Oriented Development NAMA in Colombia aims at reducing private vehicle GHG emissions through the creation of urban environments that provide alternatives to automobile travel, e.g. by improving urban development around public transport stations, blending low-income and market-rate housing with commercial uses to create neighbourhoods attractive for walking, living, working, shopping and playing. Within the next few years the Government of Colombia will have invested nearly USD 10 billion from the public budget in public housing and mobility. A NAMA Support Project funded by the NAMA Facility provides an additional 15 million EUR of international climate finance in the form of grants, 4 million EUR of which will be used for technical assistance and 11 million EUR for the establishment of a trust fund at the Colombian National Development Bank FINDETER. FINDETER in turn will use the trust fund to provide grants, concessional loans and other financial instruments to projects by cities or private companies. For example, a local Special Purpose Entity (SPE), which has been created to manage public and private development in a neighborhood area, could receive a grant from the NAMA Trust Fund for the design and engineering of a bus rapid transit station integrated with a shopping centre. In addition, FINDETER could give a market rate loan to the transit agency, linked to the design grant, for construction of the actual station. The NAMA Support Project funds may potentially be used alongside FINDETER's existing 200 million Sustainable and Competitive Cities Programme, which is supported by IADB. Generally speaking, the NAMA Facility funds support the design and management of the approach for sector transformation, and provide targeted co-funding for the implementation of concrete sustainable transport measures.

Project-based transport NAMAs account for a minority; out of the 42 NAMAs listed in the Transport NAMA database[24], only 9 are categorised as project NAMAs. However, as strategy, policy or programme-based NAMAs frequently aim at incentivising investments in (infrastructure) projects, it is still important to have a basic understanding of how transport infrastructure investments on a project level are structured. The possible relationship between the development of a financial structure of a project-based NAMA and a NAMA that deploys financial incentives in the context of a policy, strategy or programme-based approach is also illustrated in Figures 3–1 and 3–2.

Figure 3-1 provides a schematic description of the costs, revenues and financing opportunities of project-based transport NAMAs. The process of developing such a financial structure is not specific to transport NAMAs, but is frequently used in many contexts for the development of financing concepts and business plans, mostly for project-based types of investments. Key questions for the financial analysis and development of a financial structure are "How much do the activities cost?" (see section 3.3.1), "What are potential revenue sources?" (see Section 3.3.2), "How can any upfront investment costs be financed?" (see Box 30) and "Do we need additional funding to make the project financially viable?" (see Section 3.3.2).

[24] See http://www.transport-namadatabase.org

Figure 3-1: Project-based NAMAs – Schematic depiction of costs, revenues and financing structure and questions

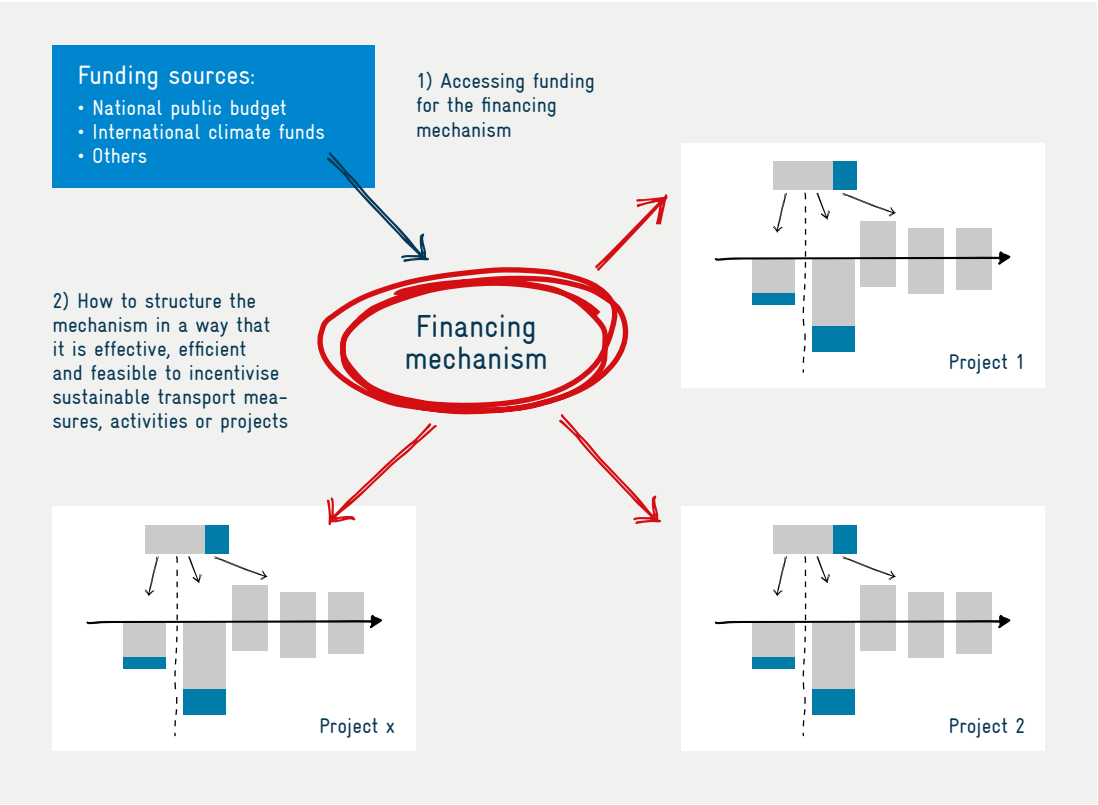




Bangkok, Thailand; Photocredit: Manfred Breithaupt/2013

Figure 3–2 demonstrates two key steps in the set-up of a financial structure for a strategy, policy or programme-based NAMA for a case where this financing mechanism provides incentives to concrete sustainable transport measures. The sustainable transport fund implemented as part of the Mexican Public Transportation Federal Support Program (PROTRAM) (see Box 27) is a good example for such a financial mechanism. The fund provides partial subsidies for sustainable urban transport measures. Its design requires a detailed understanding of the characteristics of project finance of the individual transport projects (as depicted in Figure 3–1) at the urban level in order to make the subsidy mechanism work in an effective and efficient manner. Although the numbering of the questions may imply a consecutive order, the development of the financial structure follows an iterative approach in reality.

Figure 3–2: Strategy-, policy-, or programme-based NAMAs – Schematic depiction of two key steps in the set-up of a financing mechanism




**Box 27:**

**Public Transportation Federal Support Program (PROTRAM) (Mexico)**

In 2009, the Mexican federal government created the Public Transportation Federal Support Program (PROTRAM) funded by the National Infrastructure Fund (FONADIN). This is an instrument to help finance investment projects in urban mass transportation and to promote the institutional strengthening of planning, regulation and management of public transport systems, effectively transferring funds from the national to subnational levels. It offers grants to sub-national governments to cover up to 50% of studies and 50% of infrastructure costs as well as credit warranties for public transport projects in cities of over 500,000 population that meet certain criteria. Private participation in the total investment is over 34%. The fund supports projects at federal, state and municipal levels, primarily for feasibility studies and project investment in infrastructure and transport equipment. Support can be recoverable or non- recoverable and is used to finance investment in mass transit equipment, workshops and warehouses through subordinated debt, equity or guarantees. The eligible projects can be suburban trains, metros, light train, trams, BRT and multimodal integration infrastructure.

This is the first programme in Mexico that provides federal funding for public transport. As of 2012, the PROTRAM project portfolio includes 40 public transport projects with a total funding by the federal government of approximately US$ 4 billion. Two of these public transport projects are in the implementation phase. The World Bank / Clean Technology Fund Urban Transport Transformation Project complements PROTRAM.

## 3.2 Performing a context analysis

**Results of this step:**
**Understanding of investment environment and barriers for the implementation of the NAMA**

A context analysis is an important prerequisite for the development of a robust financing structure for a NAMA. The following presents two basic guiding questions for this analysis:

- **Guiding question 1: Who are the main financial actors, what are relevant financial flows and the nature of investments in the sector?**
- **Guiding question 2: Which (financial) barriers prevent the mitigation action from happening?**

There is some overlap between these steps and Section 1.3 of the Handbook on "Designing selected measures in more detail". Experience with the NAMA Facility, for example, shows that the financial mechanisms of existing NAMA concepts are frequently weak, and are not targeted at the main barriers preventing a transformation of the sector. Moreover, many NAMA concepts lack convincing approaches for involving different funding and financing sources, including the private sector. For these reasons, these two steps are taken up again in addition to Section 1 (which covers the technical (not the financial) design of mitigation measures).

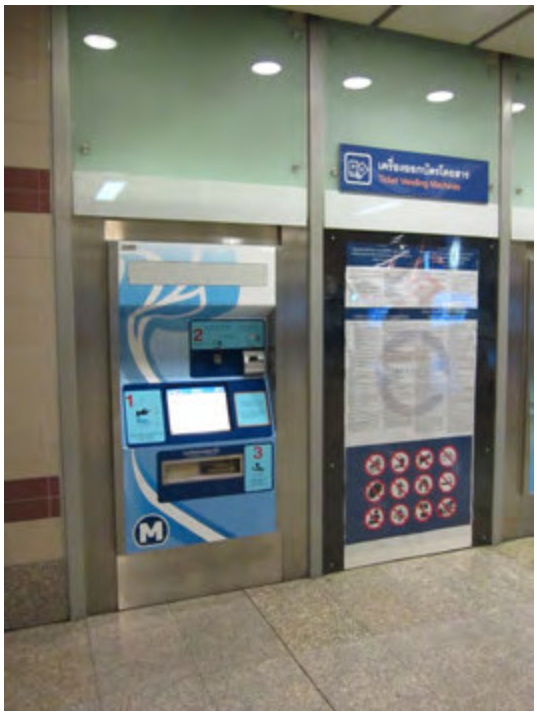
**Guiding question 1:**

**Who are the main financial actors, what are relevant financial flows and the nature of investments in the sector?**

An effective NAMA financial structure ideally builds on current mechanisms, institutions and capacities, so understanding the current nature of investments in the sector is key. Moreover, a thorough understanding of the starting point will ensure that the chosen interventions are feasible in that they either work within the existing structure of investment flows and (financial) actors and their interests, or that they contain specific interventions meant to shift investment patterns. In many NAMA development processes, in-depth analyses of the status quo in terms of technology use, regulatory environment and political interests are undertaken, yet experience shows that NAMA developers often neglect to elaborate the financial dimension of these analyses. Current investment flows and nature of investments must also be studied in a structured and thorough manner.

The following questions may be useful:

- **Business environment and investment climate:** How developed and robust are financial markets? What is the tax regime? Which skills exist on the labour market? How much regulatory and political stability is there? How well are contracts with public and private sector actors enforced? How easy is it to start, operate and close a business, including licensing and regulation?
- **Financial actors:** Who are the main financial actors in the sector today? What is the role of commercial banks and development banks?
- **Private sector:** What role does the private sector play in the sector today? Could its role be strengthened?
- **National public funding:** How much of the national public budget does the sector receive today? How is funding allocated? What public funding and financing mechanisms are in place, e.g. subsidy mechanisms, mechanisms to transfer funding from the national to the sub-national levels?



Bangkok, Thailand; Photocredit: Ko Sakamoto/2010

- **International / donor funding:** Who are the main donors in the sector? Which additional donors may be interested in supporting the sector?

**Guiding question 2:**

**Which (financial) barriers prevent the mitigation action from happening?**

A robust barrier analysis is an important prerequisite for designing effective interventions for a NAMA, as the interventions are aimed to remove one or several barriers hindering the implementation of the mitigation actions (see Section 1.3 and the Tool "Identification of barriers and supportive measures").

The financial structure of the NAMA is therefore directly linked to the barriers to be overcome. Experience shows, however, that NAMA developers frequently do not put sufficient emphasis and rigour into the barrier analysis, especially in analysing financial and market barriers and their interplay with non-financial barriers (NAMA Facility, 2014).

Specific national, sector and financial expertise are required to identify barriers in a structured manner. At the same time, analysing and determining current barriers entails a great deal of subjectivity. A private project developer may disagree with a public sector representative on the root causes of an issue. Understanding sector dynamics and differing motivations is therefore crucial. A combination of the following elements may be useful in the barrier analysis process (Romero, 2013):

- individual interviews with appropriate public and private sector stakeholders, as well as independent experts, potentially supplemented with site visits;
- literature review based on currently available information on the sector;
- focus groups to test results from interviews and find consensus;
- market mapping, particularly focused on transport services from the end consumers' perspective; and
- independent analysis of the investment patterns and hypothetical returns in the current sector in order to quantitatively assess these types of barriers.

For low-carbon transport investments, major barriers are often high-upfront costs and lacking access to capital (e.g. in the case of urban public transport infrastructure), long pay-back times of investments (e.g. of fuel efficient cars), low financial returns and high regulatory uncertainty (e.g. for the operation of public transport systems by private sector actors). Box 28 describes the financial and market barriers identified for the implementation of the NAMA SUTRI in Indonesia.

Beijing, China; Photocredit: Daniel Bongardt/2012

**Box 28:**

**Financial and market barriers identified for the implementation of the NAMA SUTRI in Indonesia**

The following institutional, financial and market barriers have been identified for the implementation of the Indonesia Sustainable Urban Transport Programme Indonesia (NAMA SUTRI), which aims to transform urban transport in Indonesia with a mix of capacity-building and investment measures provided through a national urban transport programme.

**At a national level**

a) Institutional barriers posed by the existence of separate ministries for infrastructure development and urban transport policy leads to the development of strategies that are not always aligned. Accordingly, budget allocations to urban transport systems are often done without regard for coherent infrastructure development. For example, the development of an urban rail network needs to be integrated with road development and bus systems.

b) Practice of national public transport funding: The NAMA will work with two major sources of national public funding for urban transport measures (road-based public transport, urban road development, and non-motorised transport):

1. The decentralised allocation fund (DAK) generally provides the opportunity to finance non-motorised transport projects as well as further project types (e.g. public transport infrastructure). However, these sources have not been tapped for the implementation of sustainable transport projects due to lack of technical sector guidance from the national level and lack of demand actively communicated by local governments.

2. The current practice of the MoT to support urban transport strategies of local governments is limited to providing assets (e.g. buses, traffic lights) – which in many cases is not the most efficient way of allocating the funds. The inefficiency is caused by the following issues: i) Provided assets do not match existing demand (different types of bus systems); ii) Due to legal barriers, the assets can only be given to provincial governments who do not have the mandate for bus transportation in cities; iii) Lack of quality in project preparation and management; and iv) inadequate institutional capacity for project delivery.

c) The overall amount of public funding is not sufficient to meet the investment needs of the sector. The share of urban transport funding (excluding rail) is 0.45% of the overall budget available to the Ministry of Transportation (EUR 2.62 billion in 2014). The transportation budget of the Ministry of Public Works amounts to about EUR 4 billion in 2014. Funding is mainly used for major infrastructure development such as roads, railways, airports and ferry ports.

**At a local level**

a) Local governments have limited fiscal capacity to finance transport infrastructure at the local level. Many cities do not meet loan or grant requirements. Involving the private sector is challenging due to asset management regulations, local governments' limited capacity to successfully structure and manage public private partnerships (PPPs) and high transaction costs. Lacking the necessary human resources and experience, local governments are largely passive in seizing opportunities from external funding sources.

**With the Private Sector**

a) Private sector investments require a clear regulatory framework that enables companies to create revenues over longer periods. Unattractive conditions for operating urban transport services prevent private companies from making investments. Off-street parking facilities are often not utilised due to limited or insufficient enforcement of parking policies. Operation of public transport corridors requires profitable basic infrastructure and regulation of minibus services.

b) Public transport providers lack the financial capacity to comply with terms and conditions of commercial banks (i.e. short pay back periods and high interest rates) which prevents investment into more energy-efficient vehicles or vehicle fleet expansion. High interest rates often limit purchases of new buses or vehicle replacements. In many cases, private bus companies do not meet the eligibility requirements for loans at the usual capital market interest rates of 14-16%. Dedicated private credit institutions, which charge very high interest rates (approx. 18%), are often used as a lender of last resort to borrow funds for fleet investment. In the majority of cases, most private companies can only afford investments in line with their own capacity to save.

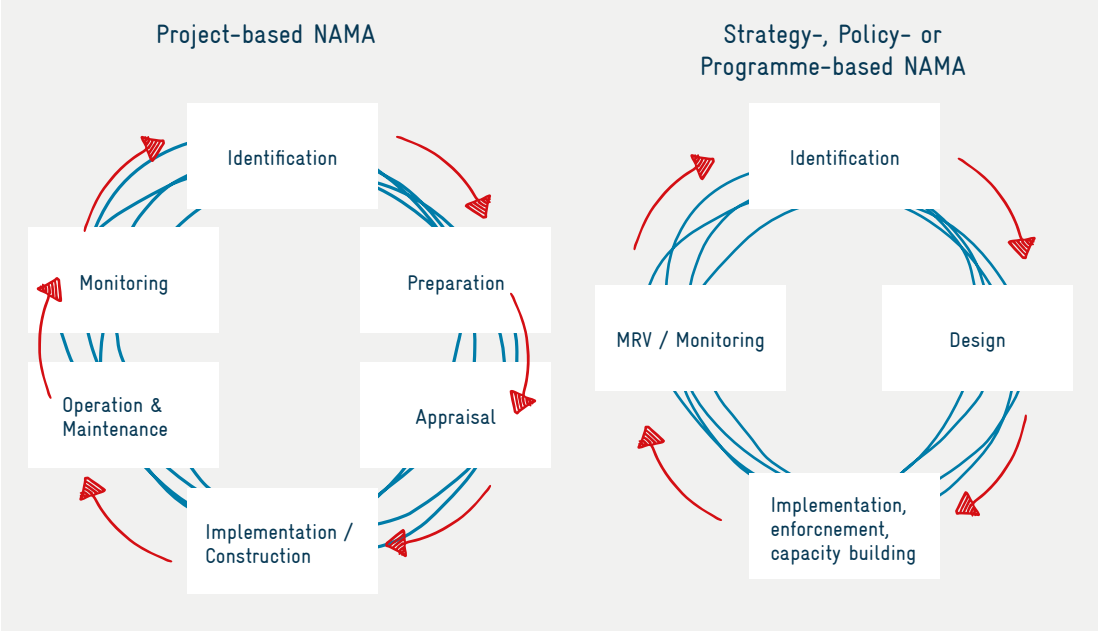
## 3.3 Identification of costs and revenues

### 3.3.1 Break down the NAMA into individual activities and assign costs

**Results of this step:**
**Quantification of costs of individual activities of the NAMA**

To be able to estimate the costs of a NAMA in detail, the planned measures need to be broken down into individual activities. As a structure for doing so, one can use a typical project cycle or a version adapted to a strategy-, policy- or programme-based NAMA (Figure 3–3), as this ensures that costs for key components such as operation, maintenance and monitoring – which can easily be neglected – are taken into account.

Figure 3–3: Typical project cycle and adjusted version for strategy-, policy- or programme-based NAMAs. Note that capacity building may also well be part of the implementation of a project-based NAMA.




Each activity is then assigned a cost estimate. The specification of costs depends on available data and resources. As stated above, it is likely that one would start with rough estimations in the identification and early planning phases and move to more detailed calculations during appraisal and before reaching a final agreement with funders and investors. Cost estimates are then revised regularly as part of the monitoring process. As an example, Box 29 provides the cost estimates of the Guangdong Green Freight Demonstration Project funded by the Global Environment Facility (GEF).


Kaohsiung, Taiwan; Photocredit: Carlos Pardo/2010

**Box 29:**

**Cost estimates and the financing mechanism of the Guangdong Green Freight Demonstration Project funded by the Global Environment Facility (GEF) (Cambridge Systematics, 2015)**

The objective of the Guangdong Green Freight Demonstration Project is to demonstrate that using technologies to improve energy efficiency of trucks can yield global and local environmental benefits in terms of reducing GHG emissions and improving air quality, and help in "greening" the road freight sector. The project has the following four components:

- **Green Truck Technology Demonstration:** Incentive payments (government rebates) for installing energy efficient technology on trucks, as well as a green freight trade fair and vehicle monitoring systems and evaluation reporting;
- **Green Freight Logistics Demonstration:** Conducting market studies for "drop and hook" logistics methods and a proposed provincial logistics brokerage platform;
- **Capacity Building:** Providing technical advisory services for policy research and training of officials and private stakeholders and dissemination support via Guangdong green freight websites; and
- **Project Implementation Support:** Providing technical advisory services for project implementation, stakeholder consultations, project results evaluation and dissemination, and project management.

Table 3-1 provides an overview of the cost estimates for the project.

**Financing mechanism**

The majority of the funding (67 per cent) is allocated to incentive payments, which are paid in the form of rebates and performance payments to the participating trucking companies. Companies themselves provide the largest share of the project cost through enterprise co-financing. The participating companies have a clear incentive to invest in new technologies that have the potential of reducing their fuel consumption and lowering their operating costs. The performance of these new technologies, however, was unproven. Thus, some incentives were needed to get these companies to take the final step and invest in new technologies. These incentives are provided by the GEF grant in two ways:

- **Green Freight technology rebates** – a transfer in the form of a rebate for investing in a technology that improves fuel efficiency. These rebates lower technology purchasing costs. The point of giving these rebates is to bring the cost of new technology in line with (or close to) older technology so that the new technology is no longer cost prohibitive; and
- **Performance-based payments** that provide incentives to participating companies to properly operate these fuel saving technologies and monitor the results.

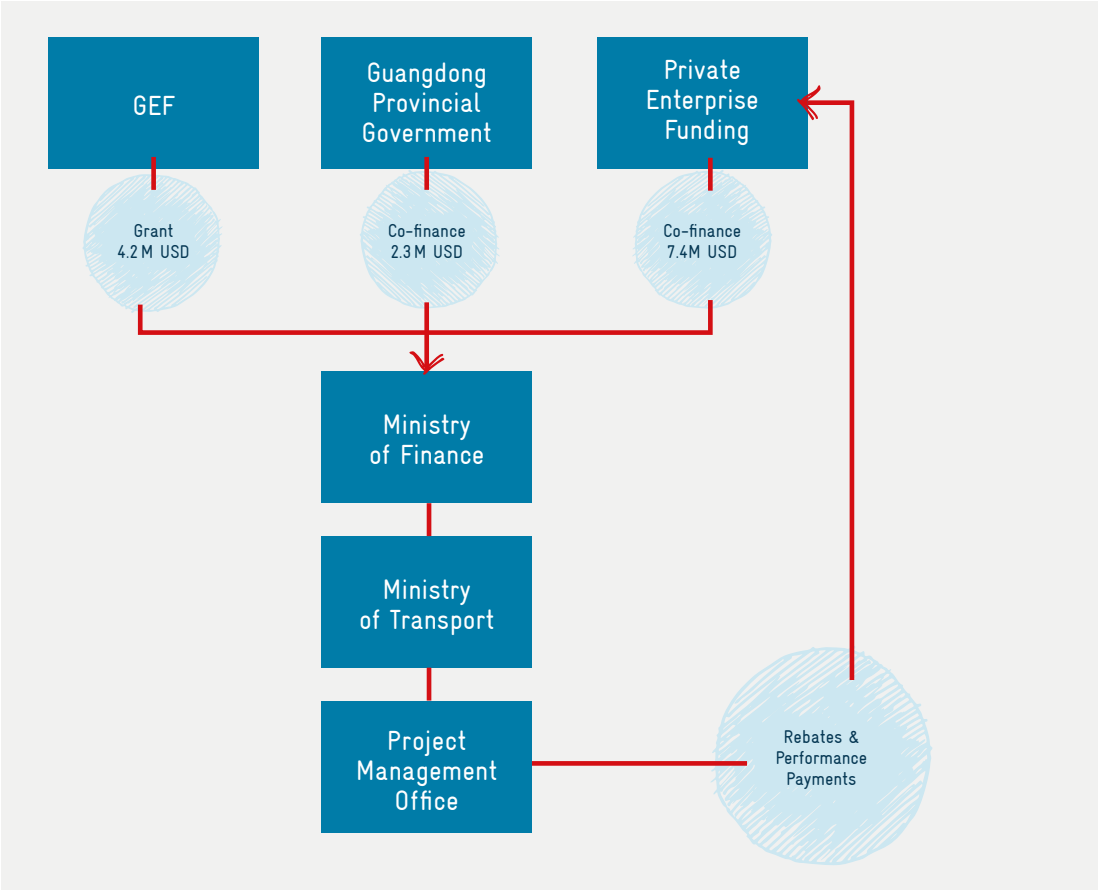
Figure 3-4 shows a financial flow chart for the project.

Table 3-1: Cost Estimates of the Guangdong Green Fright Demonstration Project

| Component | Total Cost (USD) | GEF Co-finance (USD) | Government Co-finance (USD) | Enterprise Co-finance (USD) |
|---|---|---|---|---|
| **Component 1: Green Truck Technology Demonstration** | | | | |
| Trade Fair | 150,000 | 150,000 | 0 | 0 |
| Incentive payments | 9,337,000 | 1,965,000 | 0 | 7,372,000 |
| Driver training | 70,000 | 70,000 | 0 | 0 |
| Vehicle monitoring equipment | 148,000 | 115,000 | 0 | 33,000 |
| Vehicle monitoring and evaluation | 100,000 | 100,000 | 0 | 0 |
| **Sub-Total** | **9,805,000** | **2,400,000** | **0** | **7,405,000** |
| **Component 2: Green Freight Logistics Demonstration** | | | | |
| Logistics brokerage study and demonstration | 540,000 | 540,000 | 0 | 0 |
| Drop and Hook operation study and demonstration | 1,360,000 | 460,000 | 1,000,000 | 0 |
| **Sub-Total** | **1,900,000** | **900,000** | **1,000,000** | **0** |
| **Component 3: Capacity Building** | | | | |
| Green Freight policy research | 90,000 | 90,000 | 0 | 0 |
| Government and enterprise management training | 250,000 | 250,000 | 0 | 0 |
| Project website | 1,155,000 | 100,000 | 1,055,000 | |
| Project promotion | 150,000 | 110,000 | 40,000 | 0 |
| **Sub-Total** | **1,645,000** | **550,000** | **1,095,000** | **0** |
| **Component 4: Project Management/Implementation Support** | | | | |
| Technical advisory and quality Assurance | 100,000 | | | |
| Technical assistance for implementation of Green Truck technology component | 60,000 | 60,000 | 0 | 0 |
| Procurement agent | 50,000 | 50,000 | 0 | 0 |
| Project completion report | 10,000 | 10,000 | 0 | 0 |
| Evaluation and dissemination workshops | 50,000 | 50,000 | 0 | 0 |
| PMO incremental operating cost | 290,000 | 20,000 | 270,000 | 0 |
| **Sub-Total** | **560,000** | **290,000** | **270,000** | **0** |
| **Total Baseline** | **13,910,000** | **4,140,000** | **2,365,000** | **7,405,000** |
| **Contingency** | **60,000** | **60,000** | **0** | **0** |
| **TOTAL COST** | **13,970,000** | **4,200,000** | **2,365,000** | **7,405,000** |

Source: World Bank, 2011.

Figure 3-4: Guangdong Green Fright Demonstration Project financial flow chart




Bangkok, Thailand; Photocredit: Stefan Bakker/2012

A template such as the one presented in Table 3-2 may help in compiling the cost estimates.

Table 3–2: Template for estimating costs of a transport NAMA. Note that the table only looks at costs from the point of view of one actor, e.g. government. To get a full overview of all costs, the perspective of all other actors must be taken into account.

| | Activities / Items | Year 1 | Year 2 | Year ... |
|---|---|---|---|---|
| **(1) Costs** | | | | |
| **Identification, Preparation, Appraisal** | | | | |
| Personnel | | | | |
| Consulting services | | | | |
| Procurement (goods, equipment, software) | | | | |
| Running costs (rent, office expenses, travel costs) | | | | |
| **Implementation / Construction** | | | | |
| Personnel | | | | |
| Consulting services | | | | |
| Procurement (goods, equipment, software) / Construction | | | | |
| Financing costs | | | | |
| Running costs (rent, office expenses, travel costs) | | | | |
| **Operation and Maintenance** | | | | |
| Personnel | | | | |
| Consulting services | | | | |
| Procurement (goods, equipment, software) | | | | |
| Financing costs | | | | |
| Running costs (rent, office expenses, travel costs) | | | | |
| **Monitoring / MRV** | | | | |
| Personnel | | | | |
| Consulting services | | | | |
| Procurement (goods, equipment, software) | | | | |
| Running costs (rent, office expenses, travel costs) | | | | |
| **Other costs** | | | | |
| Overheads | | | | |
| .... | | | | |

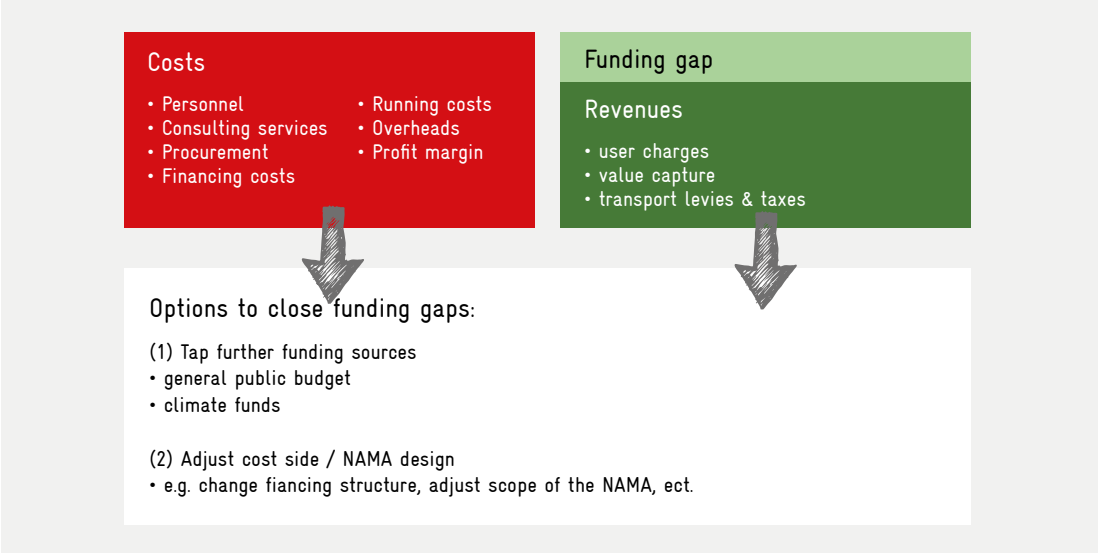
For the preparation of cost estimates, it is advisable to consult people with experience in planning and implementing similar measures. In that context, cost estimates from national sources are preferable over international figures, as costs may vary widely between countries. National estimates may not yet be available – especially for new approaches – and referring to similar programmes and examples from other countries may be the best option for the development of cost estimates.

## 3.3.2 Identify funding and revenue sources

**Results of this step: Identification of funding and revenue sources**

Identifying sufficient funding sources and revenues for a transport NAMA is key for ensuring sustainable NAMA implementation. To ensure the viability and sustainability of transport services, it is important to ensure that any potential funding gaps are closed. Figure 3-5 demonstrates this for a public transport related NAMA. There are two options to close the funding gap which might emerge from a lack of financial resources to cover the costs related to the NAMA. On the funding side, further sources may be mobilised from the general public budget or climate funds. On the cost side, expenditures may be reduced by adjusting the NAMA design which might imply a rescaling of the NAMA or an alteration of the financing structure.

Figure 3-5: Closing the funding gap of a transport NAMA




**Operating revenues**

Operating revenues play an important role in ensuring proper operation and maintenance of transport services, therefore it is important to analyse potential opportunities for revenue generation.

Not all transport NAMAs have the potential to generate operating revenues. Public transport projects, for example, do generate operating revenues (see Box 30 for a more detailed description of operating revenues from public transport projects). For other project-based transport NAMAs, including non-motorised transport infrastructure such as bike lanes and pedestrian walkways, the generation of operating revenues tends to be difficult. Strategy and policy-based NAMAs may also generate operating revenues. A good example is the parking management programme in Mexico City described in Box 27. Sometimes operating revenues are indirect; such as avoided costs to the public sector. Fuel economy standards for example may entail significant cost savings for the public budget in countries where fuels are subsidised. Transport demand management measures, which reduce travel demand, also reduce the need for public investments into transport infrastructure (see e.g. Gota 2013). However, the difficulty in estimating or measuring these avoided costs to the public sector make it challenging to use them as a possible source of income.

**Box 30:**

**Types of operating revenues from public transport projects**

For public transport projects, operating revenues can come from user charges, through land value capture and through ancillary revenues such as advertising and rentals.

- **User charges** are levied through the use of transport infrastructure and services. Users are typically charged a fare to use public transport (the so-called fare-box revenues), parking facilities or city bicycle hire systems, for example. User fees may also be charged for the use of roads.

  In most developed and developing countries, user charges do not cover the full operation and maintenance costs of the respective system, let alone the capital costs required for the initial infrastructure investment. For developed countries, the fare-box recovery ratio – the fraction of operating expenses met through paid fares – varies widely between 30% in Paris, 51% in New York City, 70% in Berlin, 90% in London, 170% in Tokyo and 186% for the Hong Kong MRT.[25] Informal public transport providers in developing countries that do not have government subsidies for public transport or additional revenue sources always need to cover their full operating costs through user charges. This often leads to poor working and overall service conditions.

- **Ancillary revenue** can come from renting out commercial real estate in public transport stations and from advertising, mostly within stations and in trains, buses and bicycles. Some metro operators, such as Dubai Metro, Madrid Metro and Mumbai Metro, have also introduced naming rights for stations to secure third party revenues. In the UK, Barclays Bank, a major British bank, provided £25 million to sponsor the public bicycle hire scheme in London for 5 years.

- **Land value capture** attempts to monetise some portion of the increase in land prices resulting from infrastructure improvements. There are two primary ways this can be done; first, through the capture of value enhancement through taxes and charges, and second, through a partnership between property owners or developers and the state (so-called developer contributions) (Sakamoto et al., 2010). In the first case, revenues are raised from the landowners in a specific area in relation to the benefit of enhanced public transport services that increase land values. Enhanced public transport services can lead to an increase in customers and to reduced transport times and costs for the residents of an area. Based on periodic valuations of all property within a city the land value increases can be determined and taxed. With developer contributions, property developers are required to provide or improve transport infrastructure for a new development before being granted a planning and construction permission. If the state owns land in the area where public transport is expanded or improved, it can also generate revenue by selling parcels of land.

  One of the most prominent examples of using land value capture to improve the financial sustainability of a public transport system is the case of Hong Kong's Rail Plus Property (R+P) programme, implemented by MTR Corporation which operates Hong Kong´s extensive Mass Transit Railway network. From 2000 to 2012, 38% of MTR's corporate income came from property development, 28% from related businesses such as commercial and property lease and management business, and 34% from transit operations. Although the Hong Kong government has transferred the property development rights of government-owned land next to the railway corridors to MTR at "before-rail" market price, it profits financially from the scheme through the IPO proceeds, dividend payments, and increases in share value of MTR's stock, which is listed at the Hong Kong stock exchange (Suzuki et al., 2015). A recent report by the World Bank (Suzuki et al., 2015) provides an excellent overview of this and other examples of good and emerging practices using land value capture for funding public transport in the developing world.


Sibiu, Romania; Photocredit: Manfred Breithaupt/2007

[25] See: https://en.wikipedia.org/wiki/Farebox_recovery_ratio#cite_note-16

## National public funding

As described above, the revenue sources of a modern and efficient public transport system often do not cover the full costs of infrastructure, operation and maintenance. Nevertheless, accessible public transport systems are in the public interest due to their large socio-economic benefits (see also Section 2 on MRV) including the potential to reduce GHG emissions. For this reason, national and local governments frequently provide an important contribution to funding sustainable transport infrastructure and services. In fact, domestic public funding is the greatest revenue source for transport infrastructure investments in developing countries. As a global average, transport's average share in national budgets ranges between 3 and 7 per cent (Lefevre et al. 2014). Shifting this funding towards low-carbon transport investments will therefore be essential for reaching global climate change mitigation targets.

National governments may cover interests and repayments of loans taken up for the construction of transport infrastructure without requiring subnational entities or project sponsors to reimburse them, thus effectively providing a grant for infrastructure construction. Moreover, annual provisions for operation and maintenance may be provided in the form of grants or subsidies that typically flow from the national government to sub-national government authorities and/or to project sponsors.

At the national level, grants can be funded either through dedicated taxes and fees (e.g. fuel or vehicle taxes) in line with the "transport pays for transport approach", or through general tax revenues (e.g. value-added taxes, personal income or business and corporate taxes). Experience shows that in countries with good quality transport systems, a partial subsidisation of public transportation through fuel and private vehicle tax revenues or toll-road fees is common practice. **Because of the large socio-economic benefits of sustainable transport services, such subsidies for public transportation can be considered justified.**

Jakarta, Indonesia; Photocredit: Stefan Bakker/2011

National government can use the following principles in the creation of a sustainable funding and financing framework for the transport sector (GIZ, 2014a):

- **Acknowledging mobility as a public service.** Many countries acknowledge the necessity of universal access to mobility in policies and practice. In some countries the access to mobility services is even a constitutional right.
- **Getting institutions and framework conditions right.** A coherent policy framework should be established, accompanied by institutional and governance reforms.
- **The transport-finances-transport principle.** The transport sector is too large to be subsidised and funded by other sectors. Efficient financial support for public transportation is justified because of its economic, social and external benefits. A sector-internal, partial subsidisation of public transportation through fuel and private vehicle tax revenues is common practice in countries with good quality transport systems.
- **Pricing transport to moderate excessive demand.** Reducing the over-consumption of transport can be achieved by reducing (implicit) subsidies for individual motorised transport, especially those that make private ownership and use relatively inexpensive.
- **Setting clear investment priorities.** One of the key concerns for sustainable transport financing is how to shift investments from conventional, unsustainable modes to low-carbon, sustainable transport. National transport policies, which are to be "translated" in comprehensive sub-sector strategic plans, and local comprehensive mobility plans provide the necessary guidance for prioritising investments in the transport sector.

International public funding (and financing)

In many developing countries, development assistance has historically been an important source of funding and financing for investments in the transport sector.

## Official Development Assistance (ODA)[26]

Over the years, the share of ODA going into the transportation sector has dropped significantly. While about 40% of the World Bank Group's total lending went to transportation between 1956 and 1965, the share has dropped to 13 to 16% since the 1970s (World Bank, 1996). In 2012, about 8% of committed ODA as reported by the OECD (or US$ 8.4 billion) went to the "transport and storage" sector[27]. This was only approximately 2% of total global investment in transport (Lefevre et al., 2014).

ODA for the sector is mostly focused on supporting the planning, development and construction of transportation infrastructure and systems, as well as on rehabilitation and maintenance; it rarely supports the operation of transport systems. Grants are provided mostly for the studies on the design and management of transport systems, whereas concessional loans – also called soft loans[28] – are mostly given for construction and rehabilitation of transport systems.

**Sustainability, including climate change mitigation aspects, plays an increasingly larger role in the provision of ODA to the transportation sector. This also provides important opportunities for funding and financing transport NAMAs.** In the context of the 2012 Rio+20 United Nations Conference on Sustainable Development, eight of the large Multilateral Development Banks[29] formed a joint MDB Working Group on Sustainable Transport, making a commitment to provide more than $175 billion of loans and grants for transportation in developing countries from 2012 to 2022 (MDB Working Group on Sustainable Transport, 2015). In 2013, the eight MDBs reported spending US$ 25 billion on the transportation sector.[30] At the same time they committed to using this funding for more sustainable transport projects promoting accessible, affordable, efficient, financially sustainable, environmentally friendly, and safe transport. Seven of the MDBs reported (Group of MDBs, 2014) investments and technical assistance of US$ 3.58 billion in climate change mitigation related measures in the transport sector in 2013.

This demonstrates two points: first, the MDBs are shifting more of their transportation related funding to sustainable and climate friendly transport; however, significant investments still go to traditional transport infrastructure investments such as interregional highways or similar projects. Second, it is often challenging to make a distinction between international public funding classified as official development assistance and as climate finance, even though climate finance should be new and additional according to some of the definitions of climate finance under the UNFCCC.

[26] Please note that ODA and climate finance that is provided as repayable funds does not classify as funding but as financing as per the definition provided in Box 25. For the sake of simplicity, ODA and climate finance are still described in this chapter.
[27] See http://stats.oecd.org/
[28] Concessional loans are provided in the context of development assistance at more favourable terms than available on the commercial financial market and therefore have a grant component. The favourable conditions and grant component relate to one or more of the following: longer payback times (frequently in the range of 15 to 30 years), lower interest rates and longer grace periods granted before the first installment. The conditions of the concessionality of these loans vary in line with the national context, with the most favourable conditions granted to least developed countries. Strictly speaking, only this grant component of the loan would count as funding, as it implies a real reduction in costs for the recipient of the loan. Beyond that, concessional loans are simply a form of financing, as they must be reimbursed through operating revenues or national public funding such as taxes (Source: AFD (2014) Who pays what for urban transport – Handbook of good practices)
[29] These are the African Development Bank (AfDB), Asian Development Bank (ADB), Development Bank of Latin America (CAF), European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), Inter-American Development Bank (IADB), Islamic Development Bank (ISDB), and World Bank.
[30] Due to underlying assumptions, this number is not equivalent to the OECD DAC data cited above.

**Climate finance**[31]

The potential for accessing international climate finance has been a major driver behind the development of NAMA concepts. Climate finance, in the case of NAMAs, refers to international public support from developed countries for mitigation measures in developing countries. As suggested earlier, it is often difficult in practice to distinguish clearly between specific climate finance and ODA, or "climate-friendly" ODA. There are a few international donors who offer climate funds with a specific focus on supporting the development and implementation of NAMAs. In addition, a variety of other climate finance sources could potentially be used for transport NAMAs.

However, the majority of climate finance is not channelled through UNFCCC-related or multilateral climate funds, but rather through bilateral donors and the MDBs. With the operationalisation of the Green Climate Fund (GCF), which forms part of the financial mechanism of the UNFCCC, this picture is likely to change. The GCF is expected to disburse a significant share of international climate finance in the future. Regardless, climate-related ODA as described above is still likely to play a significant role. The application procedures of climate funds are often complex and time consuming, which may be one of the reasons why leveraging investments from commercial banks and other private investors through climate finance is challenging.

**When considering accessing climate finance for transport NAMAs, it is recommended to consider funds with a specific focus on NAMAs or climate change mitigation, such as the NAMA Facility and the GCF, alongside with other climate-related funding sources including traditional ODA.**

Relevant climate finance sources with a specific focus on NAMAs include the following:

- The **NAMA Facility** aims to support the implementation of ambitious NAMAs. Proposals for NAMA Support Projects are selected for funding on the basis of annual competitive calls for proposals. The NAMA Facility provides grants in the size of EUR 5 to 20 million (see www.nama-facility.org).
- The **Global Environment Facility (GEF)** was established at the 1992 Rio Earth Summit, to help tackle pressing environmental problems worldwide. Since then, the GEF has provided over $14 billion in grants and mobilized in excess of $70 billion in additional financing for more than 4,000 projects. The GEF has become an international partnership of 183 countries, international institutions, civil society organizations, and private sector to address global environmental issues. https://www.thegef.org/gef/
- The **Green Climate Fund** (see www.gcfund.org/) is part of the Financial Mechanism of the UNFCCC. With pledges of more than US$10 billion, it has become the largest multilateral climate fund. In mitigation, the fund aims, amongst others, to support "Increased access to low-emission transport". The approval of the first GCF funded projects in November 2015 is expected to provide more clarity on how GCF funds can be used in the transport sector.


Buenos Aires, Argentinia; Photocredit: Carlos Pardo/2008

[31] For the sake of simplicity, climate finance is covered here under the section on "Funding mechanisms". In reality, a significant part of climate finance, namely part of all concessional loans provided as climate finance, would more accurately be considered "financing", given that the loans need to be repaid, albeit at more favorable conditions than available on commercial financial markets.

In addition, the following online databases and publications provide more information on opportunities for accessing international climate finance for transport NAMA implementation:

- The technical guidebook "Accessing Climate Finance for Sustainable Transport: A Practical Overview" (GIZ / BtG, 2013), available at http://www.sutp.org/files/contents/documents/resources/B_Technical-Documents/GIZ_SUTP_TD5-Accessing-Climate-Finance-for-Sustainable-Transport_EN.pdf, provides an overview of existing and proposed sources of climate finance in the land transport sector.
- The website Climate Funds Update (see http://www.climatefundsupdate.org/) and the OECD Climate Fund Inventory Database (see https://g20.org/wp-content/uploads/2015/09/Climate-Funds-Inventory.xls) provide information on the growing number of international climate finance initiatives, including the scale of proposed and actual financing and on how funds are used with respect to their focus, regions and particular projects.
- The online database climate Finance Options (see http://www.climatefinanceoptions.org) provides an overview of funding sources available for climate change adaptation and mitigation projects. Funding sources can be searched by sector.
- The SLoCaT Climate Finance Transport Projects Matrix (see http://www.slocat.net/sites/default/files/climate_finance_transport_projects_matrix_1.4_0.xlsx) provides an overview of transport-focused projects financed through six of the major international climate finance initiatives.

Specific climate funds, like the ones mentioned above, obviously have a strong focus on climate change mitigation, including GHG emission reductions to be achieved by a NAMA. Climate funds tend to require a, estimate of the emissions reductions to be achieved and the establishment of an MRV system. Many of the other climate related funding sources have a stronger development focus with climate change mitigation being one of the key co-benefits of an initiative. Funding proposals to any of these sources should be targeted to the focus of each fund, as some NAMA proposals may be more suited for specific climate funds due to their strong focus on GHG emission reductions, whereas NAMA proposals with GHG emission reductions that are more difficult to determine, or the main focus is on development benefits, may be more successful in accessing climate related ODA.

Bangkok, Thailand; Photocredit: Dominik Schmid/2010

# 3.4 Develop the financial structure of a project-based transport NAMA

## 3.4.1 Conduct an economic appraisal for a project-based NAMA

**Results of this step:**
**Decision if a project should be implemented for societal benefit**

Economic appraisal is crucial for the decision making process of major transport projects, used to prioritise between alternative interventions or to accept or reject a specific project. It also helps to adjust the design of a project in order to maximise its benefits.

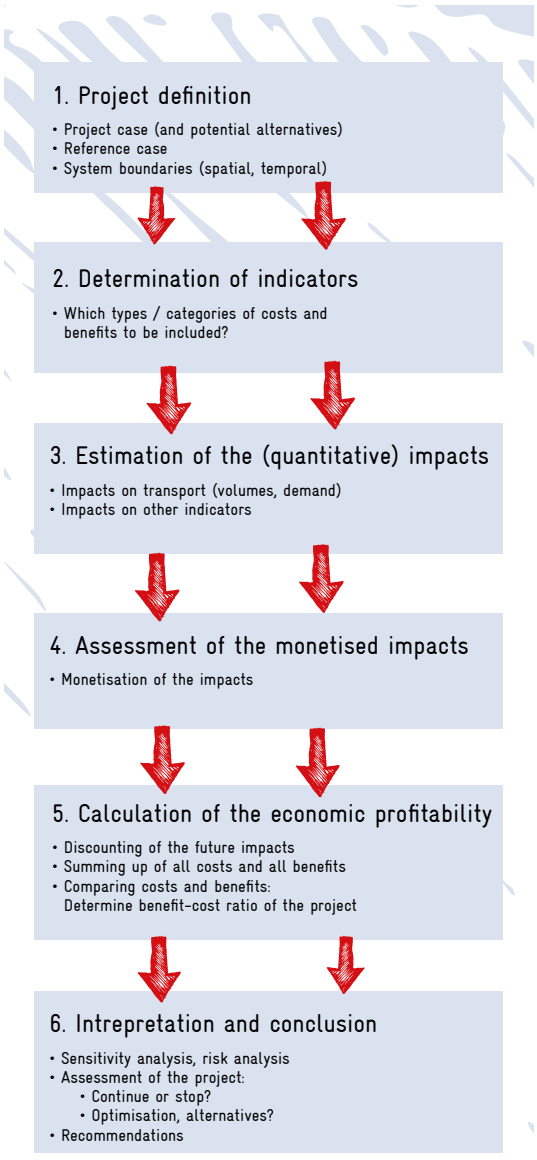
Economic appraisal aims to determine if a transport project intervention is worthwhile from an overall societal point of view. This is especially important in the transport sector, where decisions affect a wide range of actors. These include users of different modes of transport, transport operators, local residents and businesses, land and property owners, and national and local taxpayers, each with a different perspective and interest in the intervention (Adler, 1987).

Many transport projects have a poor financial performance from a micro-economic point of view without government support. Such projects would not be financed solely by the private sector. Private sector actors evaluate projects based on standard financial indicators such as Return on Investment and Net Present Value focusing on private financial returns. A micro-economic analysis does not take into account the mostly large positive external effects of sustainable transport projects and significant negative external effects of many forms of private transport. Economic appraisal takes a broader perspective to include other benefits and costs to society. It estimates the value the project generates to all stakeholders determining whether society benefits from the investment (EIB, 2013). Key societal benefits of sustainable transport systems include time savings, road safety, and improved health due to reduced air pollution and/or through increased physical activity.

Economic appraisal is applied widely by governments, their planning departments, and development banks; all transport infrastructure projects receiving loans from multilateral development banks need to undergo an economic appraisal. Economic appraisals are usually performed by specialised experts, either from within the government or development banks or through external consultants. For the process of developing the financial structure of a NAMA, it is important to be aware of the key steps in the appraisal process and the advantages and limitations of different appraisal methods.

Examples of such appraisal frameworks may be found in the further reading section of this chapter.

Figure 3-6: Steps of a Cost-Benefit Analysis



A full appraisal will only take place once a larger number of potential interventions has been screened and limited to a few options. For the sake of consistency, the indicators used in the earlier stages of selecting an option should relate to the criteria to be used for the full appraisal and in the final decision EIB (2013). Thus, at the earlier stages of NAMA design (see Section 1), the appraisal indicators should already be considered.

The most important economic appraisal method for transport projects is the Cost-Benefit Analysis (CBA). The CBA is the standard approach used by public authorities and multilateral development banks to assess transport projects from a broad economic point of view, taking into account greater effects on the economy as a whole. Figure 3-6 shows the main steps of a transport Cost-Benefit Analysis.

One major advantage of the Cost-Benefit Analysis is that the various impacts can be simply summed up and compared (annual costs/benefits at present, i.e. net present value). The following table shows the types of costs and benefits that are generally taken into account in CBAs for transport investments or other transport measures.

Table 3-3: Categories of costs and benefits

| Categories of costs and benefits |
|---|
| Investment costs:<br>- construction costs<br>- land costs<br>- replacement costs (plough-back) |
| Operation and maintenance costs of transport infrastructure |
| Operation costs and revenues of transport companies (companies offering transport services, such as railway services, airlines, public transport companies etc.)<br>e.g. loss of revenues of railways due to modal shift to private road transport as a consequence of new road infrastructures. |
| Operation costs of private transport users (existing transport demand; e.g. due to shorter/longer distances) |
| Travel time (savings) (existing transport demand) |
| Reliability (risk of delays, i.e. standard deviation of travel time)<br>this indicator rarely monetised due to methodological difficulties |
| Net benefit of additional transport demand (travel time savings & operation costs of additional transport) |
| Revenues of transport taxes and charges |
| Accidents (material damage, health costs, productivity loss, immaterial costs (injuries, deaths)) |
| Air pollution (emissions of particulate matter (PM10), nitrogen oxides, etc.) |
| Climate change / greenhouse gas emissions |
| Noise emissions (health costs, quality of life) |
| Other environmental impacts (if they can be monetised) |

One possible result indicator of a CBA is the benefit-cost ratio, which describes the ratio between the discounted (net present) economic benefit and the discounted economic costs (benefits / costs). The benefit-cost ratio needs to be higher than 1.0 for the project to be considered economically profitable. Another similar result indicator is the economic net present value, which is the difference between the discounted total social benefits and costs (benefits – costs). The economic net present value needs to be above zero.

Although Cost-Benefit Analysis is the most common methodology used for the economic appraisal of transport projects, other approaches can be useful under certain circumstances. The CBA has some weaknesses specific to the transport sector that requires additional methods to give a broader picture for economic appraisal. For example, only impacts that can be monetised can be included in a CBA, which leaves the picture incomplete. Certain environmental impacts of transport can hardly be monetised, such as negative impacts on ecosystems. In addition, a lack of quantitative data can make it impossible to conduct a complete and reliable CBA.

In these cases, other approaches can be helpful. Alternative approaches for the economic appraisal of transport projects can include:

- **Cost-effectiveness analysis (CEA):** All relevant impacts of projects are taken into account by rating them (e.g. on an ordinal "effectiveness" scale) and are then compared to the total costs.
  Advantage: All impacts can be taken into account, even if they cannot be monetised.
  Disadvantage: It is not possible to draw conclusions on efficiency (profitability).
- **Cost–utility analysis (CUA):** Cost-utility analyses do not take into account monetary values. The focus is on the outcome, i.e. the impacts. The different impacts are rated on a homogeneous scale and then aggregated to a total value (utility). The main advantage is that all impacts can be considered and different impacts can be compared. However, it does not allow any conclusions on efficiency.
- **Sustainability assessments:** A broader approach, based on the three pillars of sustainability. This approach includes all possible impacts on the economy, ecology and society. The impacts of the three pillars are equally weighted. The aggregation of the impacts on sustainability level can be done individually, i.e. based on monetary values, utility rates or qualitatively. This approach is very broad but not yet widely used. The Asian Development Bank (ADB) has developed a Framework for a Sustainable Transport Appraisal Rating tool (Véron-Okamo & Sakamota 2014).

Results of this step:
Detailed financial structure

## 3.4.2 Design a financial structure for a project-based NAMA

When designing a feasible financial structure for a project-based NAMA, there are 3 key steps, which frequently take place in an iterative manner:

- Step 1: Decide who will deliver the infrastructure and services
- Step 2: Design a detailed financial structure
- Step 3: Undertake financial appraisal

These steps are described below in more detail. In practice, completing these steps requires the services of project finance experts.

Decide who will deliver the infrastructure and services

**Step 1: Decide who will deliver the infrastructure and services**

This step involves clarifying who is responsible for the organisation and financing of the design, construction, operation and maintenance of the sustainable transport project. These decisions are often over-looked or simplified, but they critically shape the financing mechanism for a capital-intensive sustainable transport project.

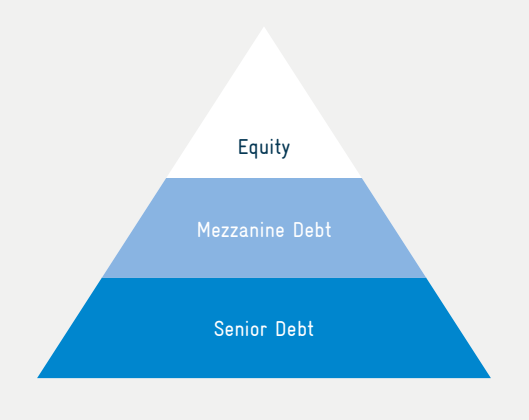
For public transport infrastructure and services, the public sector has traditionally been the primary actor in delivering and running public transport. This is often clearly demonstrated by the name of the operator on the vehicles: Australia National Railways, Delhi Transport Corporation, State Railway of Thailand and Toronto Transit, for example. These public transport undertakings typically have one common set of organisational features: they are often part of the sponsoring government ministry or local authority, have similar credit ratings, and share access and restriction to financing with their sponsor. Many governments now incorporate their public transport undertakings as limited liability state owned enterprises, but their financial characteristics remain the same.

When determining the delivery actors, NAMA developers should consider that different actors have different financial needs, cost structures, risk tolerances and competitive advantages. For example, building contractors can better manage construction risk than owners of transport projects, and international operators may be better suited to introduce international best practices.

The privatisation of public transport assets started in the late 1980s in Great Britain, and a number of other developed and developing countries followed suit. Today it is widely recognised that there is a need to mobilise financing from the private sector to meet the large demand for sustainable transport solutions. In addition, the private sector may bring other fundamental benefits. For example, it may be able to transfer project risks away from the public sector, spur technical innovations, improve operational efficiencies, yield higher service levels, bring better value for money, reduce institutional conflict of interest and secure timely asset

maintenance and thus continuation and security of expected services. However, there can be challenges and drawbacks, particularly when the privatisation process is poorly or hastily executed. Many attempts have not been successful due to weak regulatory frameworks, including instable pricing regulations, a lack of transparency in procurement processes, and insufficient understanding of the respective needs of the private and public sector. For good reason, the privatisation of transport services is controversial and often highly political. According to a recent OECD study, current experience suggests that Public Private Partnerships (PPPs) are particularly suitable for Bus Rapid Transit Systems, highly used and specific rail links, and shared-use vehicle and bicycle systems (OECD, 2013).

Figure 3-7: Project Capital Structure




Design a detailed financial structure

**Step 2: Design a detailed financial structure**

The design of a detailed financial structure for a transport project directly depends on costs and revenues (see above), on who will deliver the project, on the maturity of the financial markets of the country, and the quality of the project.

There are only two basic types of financing – equity and debt – out of which the financial structure is constructed. Equity capital is more expensive than debt – expected rates of return may range from 8% to 18%. Thus equity typically only forms a smaller portion of 5% to 30% of the capital mix. The rest of the project capital is formed by debt. Debt finance comes in different risks categories. Mezzanine debt has, for example, a higher risk than senior debt and may be employed to reduce the overall cost of capital because equity is relatively more expensive. In addition, mezzanine debt is used to attract the necessary senior debt financing because mezzanine debt investors only receive their repayments after those of senior debt (see Figure 3-7).

Some public transport companies do not have equity capital as part of their capital structure, as the respective government provides the debt investors with a guarantee for potential losses. Similarly, transport undertakings executed by the public sector also tend to have a very small percentage of equity in their total capital structure as the government acts as a guarantor. In Public-Private Partnerships it is not unusual to have several tranches of debt with different risk categories and corresponding re-payment priorities and interest rates. Furthermore, the equity capital of a PPP entity can be expected to change hands during the life of the project as some investors, such as pension funds, tend to invest post construction, and others, such as construction companies, sell out to recycle scarce equity capital.

When designing the financial structure it is critical to appreciate that a structure that works in one country may not work in another. Similarly, a structure may be

Pune, India; Photocredit: Jerome Buis/2014

fine for one project but not another, even in the same country. Market conditions also shape the financial structure required.

Undertake a financial appraisal

**Step 3: Undertake financial appraisal**

A financial appraisal assesses the viability of a project from the perspective of the project owner and/or investors determining the viability of the project based on the expected revenues and expenditures. The appraisals determines whether a project's financial return is sufficient to make the undertaking financially sustainable and commercially viable. In this sense financial appraisals share some of the concepts of economic appraisal but have a much narrower focus on direct cash flows to the project sponsors and investors. Investment decisions for transport infrastructure projects that do not involve the private sector are often based primarily on political considerations.

While the financial appraisal for a loan from a multilateral development bank is quite straightforward, a PPP structure involving the private sector can be rather complex and wide ranging.

The financial appraisal for a loan from a multilateral development bank is typically carried out at constant market prices. All revenues, net of sales or value added tax, are included as positive cash flows. Capital and operating expenditures are included as negative cash flows. Depreciation and interest payments are not included. The combined cash flows are discounted to give the financial internal rate of return (FRR), i.e. the discount rate that yields a zero NPV of cash flow over the life of the project. The FRR is then compared against the weighted average cost of capital (WACC) and if the FRR is greater, the project is considered financially viable. This cash flow modelling focuses particularly on the annual gap(s) between revenues and expenditures to highlight subsidy requirements, and is much less sophisticated compared to projects that involve the private sector.

The ADB provides a useful guide for carrying out financial appraisal in the context of the operation of the Multilateral Development Banks in chapter 3 of its Guidelines to Financial Management and Analysis of Projects[32].

Financial appraisals for PPPs are generally carried out in nominal prices with a cash flow model. This model includes not only the revenues and capital and operating expenditures, but also the tax, interest receivables and payments, loan re-payments, dividend payments, and, where applicable, foreign exchange gains and losses. This model is likely to include several reserve accounts, such as debt service and capital maintenance. While the project's FRR may be calculated, the focus is typically on the return on equity (ROE), which measures the amount of net income returned as a percentage of shareholder equity for the equity investor. In addition, the lenders use financial ratios for evaluating the debt investments such as the debt service cover ratio (DSCR), the loan life cover ratio (LLCR) and the project life cover ratio (PLCR). These debt financial ratios indicate the ability of the borrowing entity to repay an outstanding loan and the amount of cash flow available to meet annual interest and principal payments on debt, including sinking fund payments.

## 3.5 Develop the financial structure for a strategy-, policy-, or programme-based NAMA

Results of this step:
A robustly designed financial structure for a NAMA used to access international (climate) finance and/or as a basis for allocating national public funds.

Despite a wide array of transport NAMAs types, two generic sets of questions guide the design of a financial structure for a strategy-, policy-, programme-based transport NAMA, and are applicable in a variety of situations:

- **Guiding Question 1:** What would be an effective, efficient and feasible financial structure?
- **Guiding Question 2:** What sources of funding and financing from international climate finance and from national sources can be accessed for the NAMA? Can the private sector be incentivised?

Developing a financial structure for a strategy-, policy- or programme-based NAMA includes choosing a financial instrument and determining how money is going to flow, i.e. who pays what to whom and when (see financial flow charts in Figure 3-5). In most cases, the financial structure is very closely related to the choice of the intervention itself. For example, a fuel economy standard is going to require on-going public funding for the continual enforcement of the standard. A sustainable urban transport programme frequently includes a budget transfer mechanism that transfers funding from national to subnational levels (see example from Mexico in Box 27). The guiding questions do not strictly distinguish between the choice of the intervention and of the financial structure. As background information, Box 31 provides information on financing mechanisms. The two sets of guiding questions are described in more detail below.

[32] Available at http://www.adb.org/documents/financial-management-and-analysis-projects

**Box 31:**

**Financing mechanisms**

As explained in Box 25, financing mechanisms are used to put together sufficient funds, usually to pay for the construction of a project.

**The most common mechanism** for financing the upfront capital expenditures for large sustainable transport infrastructure (such as BRT, metro lines or long-distance trains) **is debt in the form of loans taken by the project sponsor**. A development bank provides loans based on the understanding that they would be paid back over time using the projects' funding sources. **Concessional loans** provided through multi-lateral development banks typically come with a grace period of up to 5 years, competitive interest rates and favourable repayment times (tenors) – loans terms of up to 25-30 years are common. Loans granted to the poorest member countries typically carry even lower interest rates and have a tenor of up to 40 years. Multi-lateral loans typically involve some form of **sovereign guarantee** from a borrower's country to repay the principal and interest. This sovereign guarantee is well known to many developing countries.

Transport NAMAs that do not require large (infrastructure) investments may not require any financing mechanisms at all. The development, implementation and enforcement of a fuel economy policy (e.g. labelling, standard and tax incentives such as $CO_2$-based vehicle taxation) could be funded through government budgets, potentially supported with international technical assistance, but no loan financing may be required.

A parking management system such as the one in Mexico City as described in Box 32 is an example of an intervention that does not require a financing mechanism (at least not for the public sector that developed the intervention).

**Financing mechanisms that incentivise private sector investments**

- **Public Private Partnerships** are contractual arrangements between a public sector agency and a private sector party that allow greater private sector participation in the delivery and operation of transport projects and facilities. PPPs allow government agencies to secure funding for an infrastructure project and delivery of a service that was traditionally provided by the public sector. Along the project cycle of a transport project, the following tasks may be divided between the public and the private sector:
  - Design (D)
  - Build (B)
  - Finance (F)
  - Operate (O)
  - Maintain (M)
  - Transfer (T)

  PPPs are named according to these abbreviations. BOT (Build, Operate and Transfer), for example, is a very common type of PPP, where the private sector is responsible for the construction and operation of an infrastructure asset, the ownership of which is transferred to the public sector after a predetermined amount of time. In public transport, many PPPs direct operation and maintenance tasks to the private sector (AFD, 2015).
- **Project bonds** are a borrowing instrument whereby the government or a private corporation issues bonds for purchase by investors. The issuer receives an immediate influx of cash that can be used to pay for a project. The investors are repaid over time through principal plus interest payments from the revenue source(s) pledged to support debt service. Such bonds are particularly attractive to institutional investors, such as pension funds and insurance companies. About 2% of transport infrastructure investments in Europe are financed through the bond market. In developing countries, though, it can be challenging to attain a good enough bond rating, especially at the municipal level, making project bonds rare in the developing world; an exception to this is the rail market in China (Lefevre et al., 2014).

  In the context of international climate finance, climate bonds have recently received a high level of interest. Climate bonds (which may be corporate bonds, project bonds or public bonds) have the potential to raise significant amounts of financing for low-carbon investments. The Climate Bonds Initiative (see www.climatebonds.net) is currently developing eligibility criteria for climate bonds in the land transport sector as a basis for certifying such bonds as climate-friendly.
- **Risk guarantees** are generally linked to debt financing and cover defined risks, such as political risks, expropriation, policy changes, currency risks etc. If an investor experiences any losses or reduced income due to risks covered by the guarantee, the provider of the guarantee will compensate the investor for these losses. In the transport sector, risk guarantees are often provided by the state to attract private investors into a PPP. For example, governments might guarantee a minimum level of users for a public transport system at an agreed user charge (UNESCAP, 2013).

Hanoi, Vietnam; Photocredit: Stefan Bakker/2013

**Guiding Question 1: What would be an effective, efficient feasible financial structure?**

Effectiveness, efficiency, and feasibility are not specific to transport NAMAs, but constitute general criteria for designing public sector interventions and setting up public finance mechanisms.

**Effectiveness** in defined as the intervention's projected ability to achieve the desired goals. If the goal were a 20% modal shift from private transport to public transport and cycling, an information campaign about the environmental and health benefits of not using private cars is unlikely to be effective enough. The introduction of parking fees, bicycle purchase incentives and subsidies for public transport tickets, however, may be more effective to achieve the target.

**Effectiveness of a financial structure is directly related to its ability to address the main barriers hindering the implementation of the mitigation action:**

- If a mitigation action is not cost competitive for the investor compared to the business as usual alternative, additional funding is required to increase the returns of the investment. Similarly, if a technology is new, financial incentives may be required to convince users to take the risk of piloting the technology. The example of the Guangdong Green Freight Demonstration Project (see Box 28) demonstrates how two types of incentive mechanisms have been used to address the issue of unproven technologies for Chinese trucking companies. When using financial incentives, especially for new technologies, a major challenges lies in setting the incentive high enough to be effective, but not so high as to give the recipient an unfairly large benefit or advantage.
- If a mitigation action such as the improvement of public transport infrastructure requires large upfront capital investments, the provision of loans addresses the barrier of access to capital.

**Efficiency** refers to the amount of public sector resources spent compared to the expected impact they have. Generally speaking, one should aim at using the minimum amount of public resources possible to achieve a desired target. Very simply speaking, in some contexts, GHG emissions could be avoided by reducing commuting distances through city planning for which direct costs tend to be limited to the salaries of government officials and experts. That would be preferable over using larger amounts of public money for direct investments into public transport infrastructure.

Many donors and climate finance mechanisms explicitly refer to effectiveness and efficiency in their selection criteria. The Green Climate Fund for example seeks to "making the best investments viable with the least possible concessionality".

**Feasibility** refers to funding and financing mechanisms that are tailored to the maturity of the financial system and to the capacity of government to enforce regulations, and that are politically acceptable. In the case of a parking management system, such as the one implemented in Mexico City (see Box 32), the ability of the government to enforce parking violations was an important prerequisite for success. One aspect of political acceptance may be equity in the sense that an intervention should not have disproportionately negative effects on poor or marginalised population groups.

Concerning the maturity of the financial system, Table 3-4 shows which types of public and private financial instruments are most suited for different contexts. It shows that PPPs are typically less feasible in low- income countries, as companies face difficulties in getting long-term funding on the national financial market. Using corporate or project bonds to finance transport infrastructure is likely to be only possible in upper middle income and high income countries.

Table 3-4: Factors influencing financial sector development and feasible instruments for different levels of development (adapted from World Bank, 2012c)

| | Level of financial sector development | | |
|---|---|---|---|
| | Low | Medium | High |
| | Low income countries | Middle income countries | Upper Middle Income and High Income Countries |
| **Banking services** | Basic banks | Full range banks | Universal banks |
| **Non-bank financial services** | None | Government bonds<br>Equity | Government and corporate bonds<br>Equity<br>Alternatives (private equity, venture capital) |
| **Interest rate** | Administrative setting | Largely market based | Fully market based |
| **Access to finance for SMEs** | Limited | Partial | Readily Available |
| **Availability of long-term funding** | Limited (up to 1 year) | Partial (up to 7 years) | Full (up to 15 years or longer) |
| **Risk management** | Weak | Adequate | Robust |
| **Low-carbon financing instruments** | Lines of credit for (liquidity support)<br>Concessional financing<br>Dedicated debt funds | Lines of credit (demonstration)<br>Partial risk guarantee | Lines of credit (demonstration)<br>Partial Risk guarantee<br>Equity and venture capital funds, climate bonds |

**Guiding Questions 2: What sources of funding or financing from international climate finance and from national sources can be accessed for the NAMA? Can the private sector be incentivised?**

The second set of guiding question relates to identifying suitable sources of funding and financing for the transport NAMA. Any potential funders and investors should be involved early on in the development of the NAMA financial structure. Section 3.3.2 provides details on potential funding sources. The identification of financial sources should be based on a robust analysis of the current nature of investments in the sector, financial flows and main (financial) actors in the sector (as described in Section 3.2.) Despite these issues being covered earlier in other ways, this second set of guiding questions is mentioned again in this section as it is closely linked to the first guiding question. Both sets of questions could be used as starting points for the design of a financial structure for the NAMA:

- In the first case, one defines an objective for the NAMA and develops a (theoretically) suitable financial structure for the NAMA intervention, taking into account the barriers for NAMA implementation and the criteria of effectiveness and efficiency. Based on this approach, one would then search for funders and financiers.
- In the second case, after defining the broad objective of the NAMA, one puts a strong emphasis on determining which national and international public funds could be available and which resources could be mobilised from the private sector. Based on the requirements of the funders and financiers, one would then construct a financial intervention to achieve the objective of the NAMA.

In most cases an iterative approach is best. In the case of transport NAMAs funded through the NAMA Facility, development of all of these NAMAs had started before the funding criteria of the NAMA Facility were known. At that point in time, the process of developing these NAMAs had followed the first approach of designing financial structures that would be best suited to fulfil the NAMAs' objectives. Once the NAMA Facility was identified as a potential funding opportunity, these "ideal-world" approaches were adapted to the funding criteria and available funding volumes of the NAMA Facility.

A financial flow chart as shown in Figure 3-5 helps to communicate the planned financial structure of the NAMA to funders, investors and public decision makers.

Bangkok, Thailand; Photocredit: Stefan Bakker/2014

**Box 32:**

**EcoParq Parking Management System – Polanco, Mexico City (Cambridge Systematics, 2015)**

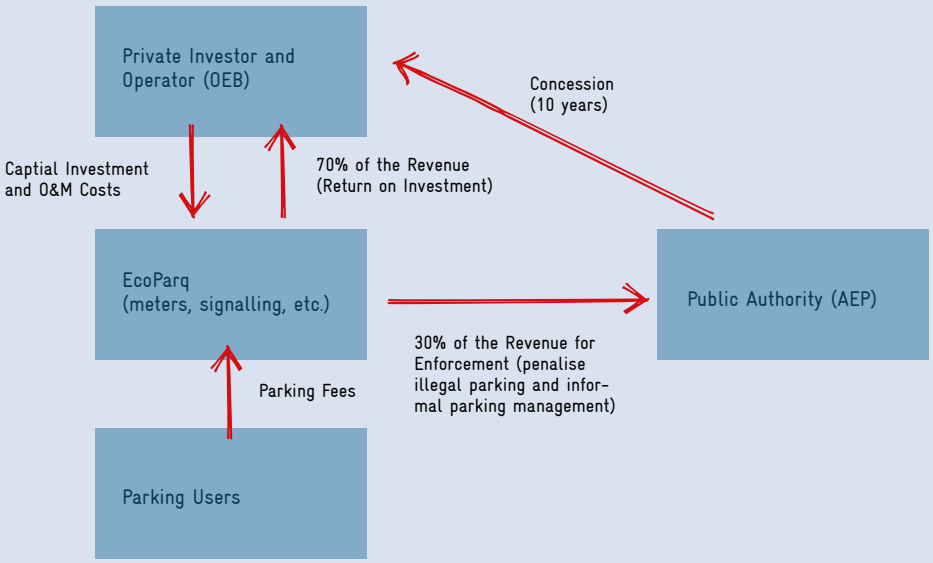
Developed in response to Mexico City's traffic congestion, EcoParq is a programme focused on regulating parking spaces and improving the overall management of the city's public spaces. Prior to the programme, parking in Mexico City was free, unregulated and controlled by independent operators with poor enforcement and widespread prevalence of parking on sidewalks and blocking driveways. This poorly managed parking space increased waiting and cruising times for drivers looking for a parking place.

The successful programme started in 2012, in Mexico City's Polanco district by introducing 426 multi-space meters. The parking rates for the parking meters were set based on parking prices charged in the city (parking meters have existed in Mexico city for years, but were hardly ever used and violators were almost never fined for not paying for parking). EcoParq operates from 8 a.m. to 8 p.m. on weekdays and charges a flat rate of USD $0.15 per 15 minutes. There is a three-hour time limit for parking in Polanco. The programme was extended to additional neighborhoods.

The installation and operation of the parking meters is completely funded by private operators. The government introduced a revenue sharing formula to ensure proper enforcement of the parking policy and curbing of illegal parking and violations. These measures by the municipality made it possible to attract the full private investment.

The private parking management company Operadora de Estacionamientos Bicentenario (OEB) is responsible for purchasing and installing the meters, setting up signalling and wayfinding systems, and operating the complete system. Capital costs in the district of Polanco were around USD 9 million, with the cost of purchasing and installing a parking meter approximately USD 10,000 to 12,000, and annual operation costs of about USD 4.5 million. The concession agreement gives OEB the rights for operating the parking management system for a period of 10 years. In exchange for investing in, installing, operating, and maintaining the parking management system, OEB gets 70% of the revenue generated from the parking meters. OEB pays 20% of its share of 70% of the parking meter revenues to the Secretariat of Public Safety for enforcing the parking policy, limiting parking violations, and fining violators. The remaining 30% of the revenues collected from the parking meters goes to AEP, the agency responsible for recovering public space in neighbourhoods. In addition, the municipality profits from revenue collection from the enforcement of tickets for violating the rules. Figure 3-8 shows a financial flow chart for the programme.

Figure 3-8: Financial flow chart




The EcoParq programme appears to have successfully realised its objectives of managing parking to increase the availability of parking spots, reducing traffic congestion caused by drivers cruising to find a parking spot, and reducing emissions as a result of reduced cruising time. Expansion of the project to other districts suggests that it is also replicable.

## 3.6 Financing process checklist and tips for further reading

The steps outlined in this handbook only describe one possible approach for the development and financing of a NAMA. In reality, this process will have to be adapted to the national circumstances and corresponding decision-making processes. Nevertheless, the major steps of the process presented in the handbook can be used as guidance, as they constitute the key elements that enable successful development and are vital to receive the necessary political, technical and financial support for implementation.

| Checklist: NAMA Financing | ✓ |
|---|---|
| Context analysis undertaken | |
| Cost estimation realised | |
| Potential funding sources identified | |
| Economic appraisal for a project-based NAMA undertaken | |
| Financial structure for the NAMA developed | |
| International support needs described | |
| Financial resources for NAMA implementation secured | |

Tips for further reading

**GIZ TRANSfer Project**

- Cambridge Systematics (2015). *Shaping the role of climate finance for sustainable transport – What are the levers and how to make them work?*, Background study undertaken on behalf of the GIZ TRANSfer project.

**Further GIZ Sources**

- GIZ Sourcebook for Decision Makers in Developing Cities: *Module 1f: Financing Sustainable Urban Transport.* Available at http://www.sutp.org/en/resources/publications-by-topic/sutp-sourcebook-modules.html
- GIZ / BtG (2013). *Accessing Climate Finance for Sustainable Transport: A Practical Overview* available at http://www.sutp.org/files/contents/documents/resources/B_Technical-Documents/GIZ_SUTP_TD5-Accessing-Climate-Finance-for-Sustainable-Transport_EN.pdf
- Diaz, R.; Bongardt, D. (2013). *Financing Sustainable Urban Transport – International Review of National Urban Transport Policies and Programmes.* GIZ & Embarq. Available at http://sustainabletransport.org/financing-sustainable-urban-transport-international-review-of-national-urban-transport-policies-and-programmes/

**Economic appraisal (CBA) tools:**

- American Association of State Highway and Transportation Officials (AASHTO) (2010) *User and non-user benefit analsis for highways („Red Book").* Extract available at https://bookstore.transportation.org/collection_detail.aspx?ID=65
- Asian Development Bank (ADB) (1997) *Guidelines for the Economic Analysis of Projects.* Available at http://www.adb.org/documents/guidelines-economic-analysis-projects
- European Investment Bank (EIB) (2013) *The Economic Appraisal of Investment Projects at the EIB.* Available at http://www.eib.org/attachments/thematic/economic_appraisal_of_investment_projects_en.pdf
- UK Department for Transport (2013) *Transport analysis guidance: WebTAG.* Available at http://www.gov.uk/transport-analysis-guidance-webtag

**Additional sources**

- Agence Francaise de Dévéloppement (AFD) (2015) *Who pays what for urban transport? – Handbook of good practices.* Available at: http://www.codatu.org/wp-content/uploads/handbook_good_practices.pdf
- Ang, G. and V. Marchal (2013), *Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure,* OECD Environment Working Papers, No. 56, OECD Publishing. Available at http://www.oecd.org/env/cc/Mobilising%20private%20investment%20in%20sustainable%20transport%20infrastructure_Consultation%20Draft%2019-09-2012.pdf
- Banister, D., P. Crist and S. Perkins (2015), *Land Transport and How to Unlock Investment in Support of „Green Growth",* OECD Green Growth Papers, No. 2015/01, OECD Publishing, Paris. Available at http://dx.doi.org/10.1787/5js65xnk52kc-en
- Buchner, B.; Stadelmann, M.; Wilkinson, J.; Mazza, F. Rosenberg, A.; Abramskiehn, D. (2014). *Global Landscape of Climate Finance 2014.* Climate Policy Initiative (CPI). Available at http://climatepolicyinitiative.org/wp-content/uploads/2014/11/The-Global-Landscape-of-Climate-Finance-2014.pdf
- Heinrich Böll Stiftung & ODI (2014). *Climate Finance Fundamentals Series.* Available at http://www.climatefundsupdate.org/resources/finance-fundamentals
- Lefevre, B.; Leipziger, D. (2014). *Transport Readiness for Climate Finance: A framework to access climate finance in the transport sector.* In the context of Bridging the Gap (BtG). Available at http://www.wricities.org/sites/default/files/Transport-Readiness-for-Climate-Finance-EMBARQ-BtG.pdf
- Lefevre, B.; Leipziger, D.; Raifman, M. (2014). *The Trillion Dollar Question: Tracking Public and Private Investment in Transport.* WRI. Available at http://www.wri.org/sites/default/files/trillion_dollar_question_working_paper.pdf
- Lütken, S. E. (2014). *Financial Engineering of Climate Investment in Developing Countries - Nationally Appropriate Mitigation Action and How to Finance It.* Anthem Press.

# Section 4

## Registration

# 4. Registration

**Introduction**

The NAMA registry is a key tool provided by the UNFCCC to share information on NAMAs. Registration is completely voluntary. The parties to the UNFCCC have developed the registry as a dynamic, web-based platform. It can be accessed at www4.unfccc.int/sites/nama. The UNFCCC 2014 registry was set up in order to:

- record NAMAs for which international support is sought,
- recognise other (unilateral) NAMAs, and
- facilitate the matching of finance, technology and capacity-building support with NAMAs.

In May 2014, Austria agreed to provide almost US$ 2 million to Georgia to help the country restore the forests in its Borjomi-Bakuriani region. This matching of financial support with NAMAs was the first of its kind since the UNFCCC launched the registry in October 2013. This example shows that early registration of NAMAs facilitates their preparation and implementation.

**Box 33:**

**The NAMA registry and reporting requirements of NAMAs**

The NAMA registry is an effort to enhance knowledge on NAMAs and to support the matching of donors and applicants of climate finance, technology and capacity-building support. The formal requirement to report on planned, current and implemented NAMAs lies within biennial update reports (BURs). However, guidance is quite general on how exactly NAMAs need to be reported in BURs.

Table 4-1: Realise the registration step by step

| | Elements and steps | Tools |
|---|---|---|
| Registration | 4.1 Get familiar with the NAMA registry | • NAMA registry user's manual<br>• UNFCCC support website for registry users including e.g. a section with FAQ, webinars, demonstration of registry functions<br>• Examples of registered NAMAs |
| | step by step | • List of registered NAMA approvers<br>• Templates for email submission |

# 4.1 Get familiar with the NAMA registry

Results of this step:
Understanding of concept and operation of the NAMA registry

NAMA registry user's manual;
UNFCCC support website for registry users;
Examples of registered NAMAs

Access rights to the Registry distinguish between NAMA approvers and NAMA developers. **NAMA approvers** are entities that centralise approval responsibility for all NAMAs in their country and have full access-rights to the registry system and all registered NAMAs in the country. There is only one NAMA approver per country. **NAMA developers** are granted rights to create NAMA entries and submit them for approval. Furthermore, they are mandated to edit, update or delete their own entries. There may be several NAMA developers per country and of different types (government, NGO, private sector, etc. as determined by national governments). The specific set-up and distribution of roles and responsibilities need to be specified by each country. Some countries have created their own national registry templates (this is the case for Colombia and Mexico).

**Three electronic templates** have been incorporated into the registry. NAMA developers must designate the NAMAs they register as one of the following three types:

1. **NAMAs seeking support for preparation:** As discussed in Section 1, transport policy-makers may identify NAMAs in the form of policies to exploit known mitigation potential, and relevant domestic strategies. This template should be used if NAMA developers already have a clear idea of the type of NAMA (strategy, policy. programme, project or a combination of these) and its related activities and if they need financial or technical support for further elaboration.
2. **NAMAs seeking support for implementation:** This template should be used if the NAMA has been formulated already and it is ready to receive finance, technology and/or capacity building for implementation. It is recommended that such an entry be created after completion of the NAMA design process, when the scope and components of the NAMA have been defined and support needs have been identified.
3. **NAMAs for recognition:** This template should be used for NAMAs that will be implemented unilaterally by developing countries and, therefore, for those no support is being sought for.

Bogota, Colombia; Photocredit: Carlos F. Pardo/2006

The amount and detail of information to be provided is flexible and up to the country since the registry operates on a voluntary basis. However, a NAMA description should be as detailed as possible in order to be well supported or recognised. The three electronic templates differ primarily regarding information on costs (section E) and on support required (section F of templates for NAMAs seeking support for preparation or implementation). NAMAs seeking support for implementation should additionally contain information on their estimated emission reductions (section G of the template for NAMAs seeking support for implementation). Table 4.2 lists all sections of the registry on which NAMA developers can provide information.

Table 4-2: Overview of the NAMA registry (Source: UNFCCC (2014))

| Section | NAMA Seeking Support for Preparation | NAMA Seeking Support for Implementation | NAMA for Recognition |
|---|---|---|---|
| A | Overview | | |
| B | National Implementing Entity | | |
| C | Expected timeframe for the preparation of the mitigation action | | |
| D | Currency | | |
| E | Cost | | |
| F | Support required to prepare the mitigation action | Support required for the implementation of the mitigation action | Estimated emission reductions |
| G | Relevant National Policies strategies, plans and programmes and/or other mitigation action | Estimated emission reductions | Other indicators |
| H | Attachments | Other indicators | Other relevant information |
| I | Support received | Other relevant information | Relevant National Policies, strategies, plans and programmes and/or other mitigation action |
| J | | Relevant National Policies strategies, plans and programmes and/or other mitigation action | Attachments |
| K | | Attachments | |
| L | | Support received | |

The secretariat of the UNFCCC created a registry support website with information to facilitate understanding: www.unfccc.int/cooperation_support/nama/items/7598.php.

Along with other information, it contains the following features:

- NAMA registry manual;
- Frequently Asked Questions (FAQ);
- fact sheets;
- recorded webinars and power point presentations;
- demonstration of the registry functions.

The full list of NAMAs that have been registered can be accessed here: www4.unfccc.int/sites/nama

## 4.2 Realise the registration step by step

**Results of this step:**
**NAMA is registered with UNFCCC and appears online in the NAMA registry.**

**List of registered NAMA approvers; Templates for email submission**

The first important step is to identify the people and organisations assigned to approve and/or develop transport NAMAs in the respective country. It is worthwhile to speak with them about the NAMA and to listen to their experience and advice. It is especially important to agree on the NAMA content with the NAMA approver well in advance, as the approver will be in charge of finally submitting the registry document to UNFCCC.

To facilitate the preparation of information for the registration of a NAMA, guidance on selected elements of the registry templates is given below. It is not intended to cover all elements, but to give guidance on selected core elements and to clarify definitions used during the registry process.

**Guidance on "General Information"**

In section A (Overview), NAMA developers must enter the implementing party (the country), summarise the action, provide information on the sectors, technologies and GHGs covered, and indicate the type of action. Except for the summary, the platform template provides a standardised multiple-choice menu for these. For instance, transport-related technology options to be ticked include 'Cleaner fuels' and 'Energy Efficiency'.

In section B (National Implementing Entity), NAMA developers indicate the implementing institution(s) (national and/or sub-national) and up to three contact persons.

**Box 34:**

**National processes related to UNFCCC registry**

As already indicated, some countries have their own national registration process that should be completed prior to recording in the NAMA Registry. This process should be understood before embarking on the creation of an entry in the NAMA Registry template. Its content is generally the same as the UNFCCC template, but national registration may require greater depth in some sections and might have additional subsections related to national low emissions development strategies or climate-change related policies.

UNFCCC has advised countries not to develop additional registration processes. They have indicated that the rationale of the registry is to create an opportunity for countries to easily present their progress on NAMA development, and that the UNFCCC NAMA registry is a universal format that should be applicable to any country.

The expected timeframe for the preparation or implementation of the mitigation action (section C) refers to the period in which activities are undertaken to initially implement a NAMA. It should not be confused with the period of monitoring GHG effects, which begins after successful implementation of the mitigation action.


Manila, Phillipines; Photocredit: Andrea Henkel/2013

**Guidance on "Cost of preparation and implementation"**

For NAMAs seeking support for preparation, the NAMA developer shall indicate the estimated full cost of preparation. For the other NAMA template types, the registry makes a distinction between **two types of implementation costs:**

- full implementation cost
- incremental cost of implementation

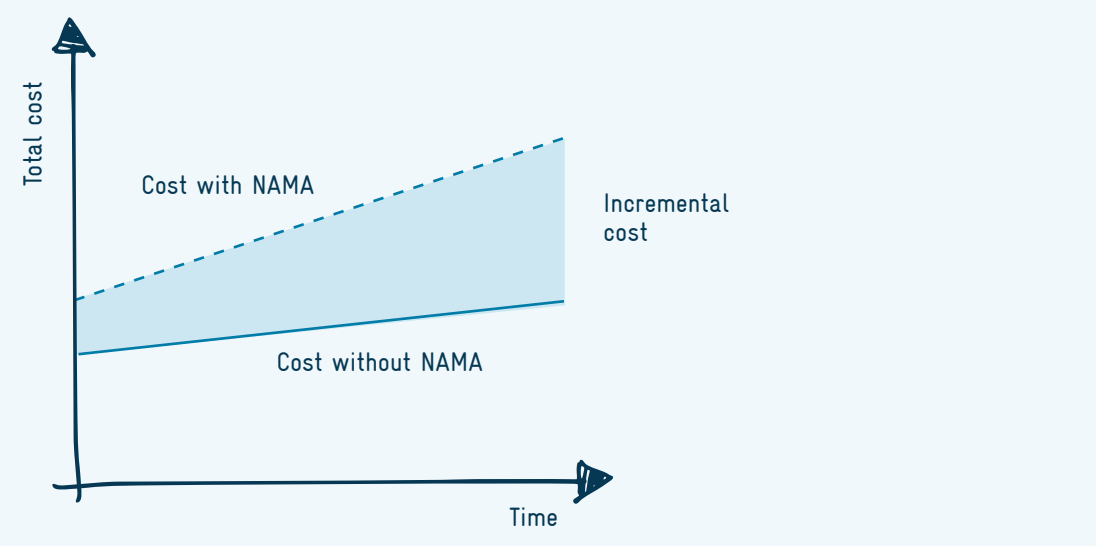
The **full implementation cost** (and closure cost) includes all expenses incurred during the lifetime of a NAMA, such as pre-operation activities (planning cost), construction, operation and maintenance, debt service and closure. The UNFCCC (2014) suggests limiting the costs "strictly" to those incurred by the implementing entities. Third party costs, that the NAMA might directly or indirectly cause, such as private expenses to comply with vehicle standards, should not be included in the sum, but can be explained in the "Comments" section. NAMA developers following this advice may be able to reduce NAMA costs to a small amount – particularly in the case of policy NAMAs. For example, a vehicle emission standard may induce only minimal governmental expenses, whereas the manufacturing and purchase of energy-efficient vehicles could impose high upfront investments on manufacturers and users, albeit with significant long-term savings and thus long-term net benefits for all. It must be noted that in some cases these governmental costs may be highly scrutinised both by government and other parties, as the NAMA registration document will be a governmental statement related to funds and must be directly related to actual budgets or a policy document.

The **incremental cost** principle goes back to the United Nations Framework Convention on Climate Change, adopted in 1992. According to the Convention, the implementation of climate change mitigation measures by developing countries depends on the availability of finance provided for them by developed countries. Developed countries shall "provide such financial resources, including for the transfer of technology, needed by the developing country parties to meet the agreed full incremental cost of implementing measures […]" (UNFCCC Article 4.3).

The underlying assumption of the incremental cost principle is that the relevant costs for complying with the Convention are relative rather than total. Any activity that is eligible to receive financial resources is compared to the baseline scenario, i.e. to the activity it replaces. The difference in cost between the two activities is the incremental cost. Incremental costs may not only include the measures for eligible NAMA funding; they are also associated with the global environmental benefits of an activity. It is important to note that **incremental costs do not include costs for NAMA preparation.**

No standard method exists for calculating incremental cost for NAMAs, and the calculation may be highly uncertain. According to the UNFCCC, NAMA developers "are invited to estimate the cost incurred in delivering mitigation outcomes and consider whether such cost could be treated as incremental costs." (UNFCCC 2014). The Global Environmental Facility (GEF) defines incremental costs as costs associated with transforming a project with national benefits into one with global environmental benefits,[33] which is in line with the UNFCCC understanding.

Figure 4-1: Incremental cost vs. total cost (Source: De Vit et al. (2012))




[33] See https://www.thegef.org/gef/policies_guidelines/incremental_costs

Several different tools for programme- or project-based NAMAs can be used to calculate incremental costs. As outlined earlier, such NAMAs may entail investment in (sustainable) infrastructure, vehicles or in other measures such as eco-driving schemes. NAMA developers may use the MRV-baseline to establish a reference case with which to calculate incremental costs. Potential donors may demand that NAMA developers disclose upfront investments, operational and maintenance costs as well as discount rates and other assumptions. Cost-Benefit Analysis (CBA) may be an appropriate tool to calculate incremental costs, as it is a well-known concept of evidence-based decision-making and widely used to assess transport measures, especially large-scale infrastructure projects (see Section 3).

In applying a Cost-Benefit Analysis (CBA), or any other method to calculate incremental costs, transport NAMA developers may face **three major challenges** (Würtenberger 2012):

- NAMA developers have to anticipate operational costs and revenues over a long lifetime. Incremental costs are therefore likely to be sensitive to the input parameters, leading to high uncertainty.
- Initiatives to foster modal-shifts to public transport usually involve public bodies with regard to infrastructure, vehicles and operation, whereas individual transport investment decisions involve a mix of public (infrastructure) and private (vehicles and operation) decision makers.
- NAMAs may not only reduce GHG emissions, but also bring about other benefits, such as improved air quality or improved access to goods and services. These additional benefits should be subtracted from incremental costs. However, in many cases they may be challenging to monetise.

In contrast to project or programme based activities, policy based transport NAMAs do not necessarily require financial investment for implementation. Regulatory, economic and planning instruments instead modify the legal and fiscal framework to set rules and/or incentives for low-carbon, sustainable transport. Consequently, their implementation may even lead to incremental benefits, i.e. the mitigation measure is cheaper than the baseline alternative.

Developing countries might face situations where there are costs associated with NAMA preparation, but, once prepared, the NAMA leads to incremental benefits. **It is important to note that developing countries may apply for support for NAMA implementation whether incremental costs are positive or negative.** Regardless, support for implementation is a matter of negotiation and the eligibility criteria of the donor.

Incremental costs of NAMAs are important for potential donors. However, the amount of support will depend on specific eligibility criteria and is negotiable. **Least-developed countries (LDCs) or NAMAs with large potential benefits which are "locked in" by a set of barriers, may even receive support for NAMAs with negative incremental costs (incremental benefits).** NAMA developers should estimate the incremental costs based on the calculations necessary to develop a financial plan (see Section 3).

Medellin, Colombia; Photocredit: Carlos F. Pardo/2013

Manila, Phillipines; Photocredit: Manfred Breithaupt/2013

**Guidance on "Support required for the implementation of the mitigation action"**

The UNFCCC specifies that support for the preparation and implementation of NAMAs should take the form of **finance, technology and/or capacity building** (UNFCCC 2011). The financial plan can form the basis for an overview of these aspects. The categorisation of different cost items (see Section 3) allows quantification of the amount of support needed. Financial support may be provided by any of the following: developed countries, entities operating the financial mechanisms of the UNFCCC, multilateral, bilateral and other public donors, private and non-governmental organisations. It may be provided under different modalities and might also differ in terms of suitability for the preparation and implementation of specific NAMAs.

Capacity-building is the development of technical skills and institutional capabilities. The UNFCCC distinguishes between **three levels of capacity building, namely individual, institutional and systemic.** Capacity-building may be required for NAMAs where support for either preparation or implementation is sought (see Section 1.3 on supportive measures). Transport NAMA developers may be particularly interested in systemic capacity building, which refers to the creation of enabling environments. NAMA preparation may also require reallocation of domestic finance or development of relationships and processes between institutions (see Section 1.4 on stakeholder involvement).

**Technology transfer** is defined as a broad set of processes involving the flows of knowledge, experience and equipment. It comprises the process of learning to understand, utilise and replicate technologies, and the capacity to choose and adapt them to local conditions and integrate them with indigenous technologies. The UNFCCC guidelines suggest that, for the purposes of providing information to the registry, technology-support relates only to equipment (hardware), while the processes of technological knowledge and education (software) are covered under capacity building. Technology transfer in the transport sector is mainly associated with (components of) low-carbon vehicles, but could also include, for example, traveller information systems.

Mexico City, Mexico; Photocredit: Carlos F. Pardo/2006

**Guidance on "Estimated emission reductions"**

For NAMAs seeking support for implementation or for recognition, the developer estimates GHG emission reductions that will result from it. These estimations should be based either on ex-ante or on ex-post calculations (see Section 2). The estimates should be coherent and thorough, but in some cases support is sought especially because more data is needed in order to produce a more complete emission reduction estimate. Thus, in these cases it is feasible to produce a rough estimate that would improve based on additional support. The spirit of NAMAs is to provide a useful indication of how policies can improve in terms of creating mitigation potential, not to stall efforts from a lack of elaborate estimates or 100% solid data at the beginning. An entry in the registry can be written in such a way that the NAMA developer can specify that more work will be done in improving calculations.

Bogota, Colombia; Photocredit: Carlos F. Pardo/2006

Tunis, Tunisia; Photocredit: Cornie Huizenga/2013


Mexico City, Mexico; Photocredit: Manfred Breithaupt/2013

**Guidance to specify "Progress on implementation and further benefits"**

If the NAMA is registered in order to receive support for either implementation or for recognition, the NAMA developer may designate indicators other than GHG benefits under "other indicators" and "other relevant information." These may be indicators for (see Section 2, 'what to be MRVed'):

- progress on implementation
- non-GHG impact

As discussed earlier, sustainability benefits beyond climate change mitigation may be an important motivation to implement transport measures as NAMAs. Accordingly, developing countries and donors may wish to record these impacts.

**Box 35:**

**Example registry entry: Sustainable Urban Transport Programme Indonesia (NAMA SUTRI)**

The NAMA SUTRI in Indonesia has defined the following indicators of progress: public transport quality, capacity and accessibility (e.g. ridership, travel speed, information, network coverage, level of service); quality of walking and cycling facilities (total length of high quality bicycle lanes, modal share, parking management, number of on-street/off-street parking spaces, regulation, enforcement); and emissions per vehicle and kilometre (to be completed).

Most of the sustainable development benefits of this programme are expected to fall in the following categories:

- Air quality
- Accessibility
- Equity
- Road safety
- City liveability

## 4.3 Checklist and tips for further reading

The steps outlined in this handbook only describe one possible approach for the development of a NAMA. In reality, this process will have to be adapted to the national circumstances and corresponding decision-making processes. Nevertheless, the major steps of the process presented in the handbook can be used as guidance, as they constitute the key elements that enable successful development and are vital to receive the necessary political, technical and financial support after implementation.

| Checklist: NAMA Registration | ✓ |
|---|---|
| Relevant stakeholders are familiar with the UNFCCC NAMA registry. | |
| Contact with the country's NAMA approver is established. | |
| NAMA developer rights are allocated. | |
| NAMA registration is prepared and content agreed upon with relevant stakeholders. | |
| The NAMA registration is approved by NAMA approver and submitted to UNFCCC. | |

### Tips for further reading

**Additional sources:**

- United Nations Framework Convention on Climate Change (UNFCCC) (2014) *Manual of the Nama Registry.* Version of 19th February 2014. Available at www.unfccc.int/files/cooperation_support/nama/application/pdf/nama_registry_manual_19_february_2014.pdf
- United Nations Framework Convention on Climate Change (UNFCC) NAMA registry support website. Available at www.unfccc.int/cooperation_support/nama/items/7598.php
- Examples of transport NAMA registry entries, including Indonesia. Available at www4.unfccc.int/sites/nama

# Bibliography


- Adler, H.A. (1987) *Economic appraisal of transport projects*. Published for the Economic Development Institute of the World Bank. Available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1999/12/20/000178830_98101911004487/Rendered/PDF/multi_page.pdf
- Agarwal, S *et al.,* (2013) *Annual Status Report on Nationally Appropriate Mitigation Actions (NAMAs).* Mitigation Momentom Project. Available at http://www.mitigationmomentum.org/downloads/Mitigation_Momentum_Anual_Status_Report_2013.pdf
- Agence Francaise de Dévéloppement (AFD) (2015) *Who pays what for urban transport? – Handbook of good practices.* Available at: http://www.codatu.org/wp-content/uploads/handbook_good_practices.pdf
- Asian Development Bank (ADB) (2009) *Rethinking Transport and Climate Change.* ADB Sustainable Development Working Paper Series Nr. 10 2009, James Leather and the Clean Air Initiative for Asian Cities Center Team. Available at http://cleanairasia.org/wp-content/uploads/portal/files/documents/ADB-WP10-Rethinking-Transport-Climate-Change.pdf
- Böhler-Baedeker, S and Hüging, H (2012) *Urban Transport and Energy Efficiency.* Sourcebook Module 5h, Sustainable Urban Transport Project (SUTP), GIZ, Eschborn, Germany. Available at http://www.sutp.org/files/contents/documents/resources/A_Sourcebook/SB5_Environment%20and%20Health/GIZ_SUTP_SB5h_Urban-Transport-and-Energy-Efficiency_EN.pdf
- Bongardt, D *et al.* (2013) *Low-Carbon Land Transport - Policy Handbook Routledge.*
- Cambridge Systematics (2015) Shaping the role of climate finance for sustainable transport – What are the levers and how to make them work?, background study undertaken on behalf of the GIZ TRANSfer project.
- Center for Clean Air Policy (CCAP) (2012a) *An Expanded Set of Metrics for MRV.* Presentation at Second Asia Regional Dialogue, July 24-26, 2012. Available at http://ccap.org/assets/An-Expanded-Set-of-Metrics-for-MRV-Ned-Helme.pdf
- Center for Clean Air Policy (CCAP) (2012b) *MRV of NAMAs: Guidance for Selecting Sustainable Development Indicators*. Available at http://ccap.org/assets/MRV-of-NAMAs-Guidance-for-Selecting-Sustainable-Development-Indicators_CCAP-Oct-2012.pdf
- Clean Air Asia (2013) *Data Guide for MRV'ing Transport NAMAs – Strategies and Projects.*
- Delucchi, M A (2010) *Impacts of Biofuels on Climate Change, Water Use, and Land Use.* Annals of the New York Academy of Sciences 1195: 28–45.
- De Vit, C *et al.,* (2012) B*uilding blocks for Nationally Appropriate Mitigation Actions.* Ecofys by order of African Development Bank (AfDB). Available at http://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Building%20Blocks%20for%20Nationally%20Appropriate%20Mitigation%20Actions.pdf
- Energy research Centre of the Netherlands (ECN) & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2014) Expert interviews on NAMA financing. Internal working document.
- European Investment Bank (EIB) (2013) *The Economic Appraisal of Investment Projects at the EIB.* Available at http://www.eib.org/attachments/thematic/economic_appraisal_of_investment_projects_en.pdf
- Figueroa Meza, M J *et al.,* (2014) *Energy for Transport.* Annual Review of Environment and Resources 39 (1).
- Fulton, L *et al.,* (2013) *Transport Pathways for Light Duty Vehicles: Towards a 2° Scenario.* Sustainability 5 (5) (April 29): 1863–1874.
- Global Energy Assessment (GEA) (2012) *Global Energy Assessment: Toward a Sustainable Future.* Cambridge University Press, Cambridge, UK and New York, USA and the International Institute for Applied Systems Analysis, Laxenburg. Available at http://www.iiasa.ac.at/web/home/research/Flagship-Projects/Global-Energy-Assessment/GEA-Summary-web.pdf
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2014a) Building Blocks for Financing Sustainable Transport Sector Development.
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2014b) *Highlights of the Transport-NAMA Session and MRV roundtable meeting from the UNEP Regional Workshop on NAMAs.* Available at http://transport-namas.org/highlights-of-the-transport-nama-session-and-mrv-roundtable-meeting-from-the-unep-regional-workshop-on-namas/

- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Institut für Entsorgungs- und Umwelttechnik (IFEU) (forthcoming) *Analysis of requirements of ex-post evaluations of GHG mitigation measures in the transport sector*.
- Godard, X *et al.,* (2001) *Guidelines for household travel survey in developing cities.*
- Gota, S. (2013) *Less is more: BRT and metro avoid expansion of road infrastructure.* Available at http://thecityfix.com/blog/less-more-brt-metro-avoid-expanding-road-infrastructure-sudhir-gota/
- Group of Multilateral Development Banks (MDBs) (2014) Joint Report on MDB Climate Finance 2013. Available at http://www.ebrd.com/downloads/news/mdb-climate-finance-2013.pdf
- Henríquez, P *et al.,* (2012) *Santiago Transportation Green Zone.Study of a Nationally Appropriate Mitigation Action (NAMA) for Transport.* Santiago: Sistemas Sustenables. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205028/STGZ-Publicaci_n.pdf
- Hinostroza, M (2012) *Measuring, Reporting, Verifying. A Primer on MRV for Nationally Appropriate Mitigation Actions.* UNEP Risø Centre, Roskilde. Available at http://namapipeline.org/Publications/MRV_PrimerNationallyAppropriateMitigationActions.pdf
- Huizenga, C and Bakker, J A (2010) *Climate Instruments for the Transport Sector: Considerations for the Post-2012 Climate Regime.* Asian Development Bank and Inter-American Development Bank. Available at http://www.slocat.net/sites/default/files/memdownloads/cits-english.pdf
- International Energy Agency (IEA) (2012) *World Energy Outlook 2012.* Available at http://www.iea.org/publications/freepublications/publication/english.pdf
- International Energy Agency (IEA) (2013a) *World Energy Outlook 2013.* Available at http://www.worldenergyoutlook.org/media/weowebsite/2013/weo2013_ch06_renewables.pdf
- International Energy Agency (IEA) (2013) *$CO_2$ emissions from fuel combustion - Highlights.* Available at https://www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2014.pdf
- Kahn Ribeiro, S and Figueroa, M J (2012) *Energy End-Use: Transportation. Global Energy Assessment - Toward a Sustainable Future,* 575–648. Vienna, Austria, Cambridge, UK and New York, NY, USA: International Institute for Applied Systems Analysis and Cambridge University Press. Available at http://www.iiasa.ac.at/web/home/research/Flagship-Projects/Global-Energy-Assessment/GEA_Chapter9_transport_hires.pdf
- Lapillonne, N and Desbrosses, B (2009) *Top-down evaluation methods of energy savings.* Enerdata, Grenoble. Available at http://www.evaluate-energy-savings.eu/emeees/en/publications/reports/EMEEES_WP5_Summary_report_May_2009.pdf
- Lefevre, B et al., (2014) *The Trillion Dollar Question: Tracking Public and Private Investment in Transport.* WRI. Available at http://www.wri.org/sites/default/files/trillion_dollar_question_working_paper.pdf
- Leiby, P N (2007) *Estimating the Energy Security Benefits of Reduced U. S. Oil Imports.* Available at http://www3.epa.gov/otaq/renewablefuels/ornl-tm-2007-028.pdf
- Litman, T (2009) *Well measured – Developing Indicators for Comprehensive and Sustainable Transport Planning.* Available at http://www.vtpi.org/wellmeas.pdf
- Marshall, J D (2011) *Energy-Efficient Urban Form.* Environmental Science & Technology 42 (9): 3133–3137.
- MDB Working Group on Sustainable Transport (2015) Progress Report (2013–2014) of the MDB Working Group on Sustainable Transport. Available at http://www.adb.org/sites/default/files/institutional-document/154603/mdb-wgst-progress-report-2013-2014.pdf
- NAMA Facility (2014) Lessons Learned 2014 – Financing the Implementation of NAMAs. Available at http://www.nama-facility.org/uploads/media/NAMA_Facility_factsheet_lessons_learned_2014.pdf
- NAMA Partnership, LEDS Global Partnership and International Partnership on Mitigation and MRV (2014) *Linkages between LEDS – NAMA – MRV.* Available at http://mitigationpartnership.net/sites/default/files/linkages-leds-namas-mrv.pdf
- OECD (2013) OECD work on Mobilising private investment in sustainable transport infrastructure. Available at http://www.oecd.org/env/cc/financing-transport-brochure.pdf

- Panorama (2009) *Greenhouse gas emissions and the transport sector.* Available at http://www.seedengr.com/Greenhouse%20gas%20emissions%20and%20the%20transport%20sector.pdf
- Replogle, M A and Fulton, L M (2014) *A Global High Shift Scenario: Impacts And Potential For More Public Transport, Walking, And Cycling With Lower Car Use.* The Institute for Transportation and Development Policy. Available at https://www.itdp.org/wp-content/uploads/2014/09/A-Global-High-Shift-Scenario_WEB1.pdf
- Romero (2013) Barrier Analysis for LEDs and NAMAs, UNEP Risø Centre.
- Rudolph, F and Böhler, S (2009) *Evaluation of energy saving measures in the transport sector: a review of efforts and certainty.* Broussous, Christel (Hrsg.): *Act! Innovate! Deliver!* Reducing energy demand sustainably: ECEEE 2009 Summer Study; conference proceedings.
- Sakamoto K et al., (2010) *Financing Sustainable Urban Transport – Module 1f – Sustainble Transport: A Sourcebook for Policy-makers in Developing Cities.* GTZ. Available at http://www.sutp.org/files/contents/documents/resources/A_Sourcebook/SB1_Institutional-and-Policy-Orientation/GIZ_SUTP_SB1f_Financing-Sustainable-Urban-Transport_EN.pdf
- Sims, R *et al.,* (2014) *Working Group III – Mitigation of Climate Change Chapter 8 Transport IPCC (Intergovernmental Panel on Climate Change)*. Available at http://report.mitigation2014.org/drafts/final-draft-postplenary/ipcc_wg3_ar5_final-draft_postplenary_chapter8.pdf
- Transport for London (2011) *Annual Report and Statement of Accounts.* London, UK: Transport for London. Available at https://www.tfl.gov.uk/cdn/static/cms/documents/tfl-annualreport-2012.pdf
- Technology Action Plan (2013) *Barrier Analysis and Enabling Framework for Climate Change Technologies Adaptation.*
- United Nations (UN) (1992) *United Nations Framework Convention on Climate Change.* Available at https://unfccc.int/resource/docs/convkp/conveng.pdf
- United Nations (UN) (2007) *Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007.* Available at http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf
- United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP) and United Nations Framework Convention on Climate Change (UNFCCC) (2013) *Guidance for NAMA Design - Building on Country Experiences.* Available at http://namapipeline.org/publications/guidance_for_nama_design_2013_.pdf
- United Nations Environment Programme (UNEP) Risø Centre (2013) *Understanding the Concept of Nationally Appropiate Mitigation. Action.* Available at http://mitigationpartnership.net/unep-risoe-centre-2013-understanding-concept-nationally-appropriate-mitigation-action
- UNESCAP (2013) *Transport Review – Chapter 3: Financing Transport Infrastructure.* Available at http://www.unescap.org/sites/default/files/TransportReview_2013_Chapter3.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) (2011): *Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011.* Decision 2/CP.17. Available at http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) (2014) *Manual of the Nama Registry.* Version of 20th January 2014. Available at https://unfccc.int/files/cooperation_support/nama/application/pdf/manual_for_prototype_version_of_30_april_release.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) (2012) *AM0031: Large-scale Methodology. Bus rapid transit projects. Version 05.0.0.* 70th meeting of the CDM Executive Board, Bonn. Available at https://cdm.unfccc.int/filestorage/u/d/BUW4M1G0IOKE29R7TF8ZQ6HVSLD5CJ.pdf/eb70_repan14.pdf?t=REV8bnhqaXJkfDDE3lnmrY-2HNpls2-yyjz0

- Van Tilburg, X *et al.,* (2011) *On developing a NAMA proposal.* ECN Discussion Paper, Petten, Netherlands. Available at https://www.ecn.nl/docs/library/report/2011/o11053.pdf
- Véron-Okamo, A and Sakamota, K (2014) *Toward a Sustainability Appraisal Framework for Transport.* ADB Sustainable Development Working Paper Series. Available at http://www.adb.org/sites/default/files/publication/31198/sdwp-031.pdf
- World Bank (1996) *Sustainable Transport: Priorities for Policy Reform*. The World Bank, Washington D.C. Available at http://www.worldbank.org/transport/transportresults/documents/sustain-transp-1996.pdf
- World Bank (2011) *China - Guangdong Green Freight Demonstration Project.* Washington, DC: World Bank, Available at http://www.worldbank.org/projects/P119654/gef-guangdong-green-freight-demonstration-project?lang=en
- World Bank (2012) *Maximizing Leverage of Public Funds to Unlock Commercial Financing for Clean Energy in East Asia*, World Bank, Washington.
- World Health Organization (WHO) (2011) *Health in the green economy: Health co-benefits of climate change mitigation - Transport sector,* World Health Organization, Geneva, Switzerland. Available at http://extranet.who.int/iris/restricted/bitstream/10665/70913/1/9789241502917_eng.pdf
- World Resources Institute (WRI) (2014) *Greenhouse Gas Protocol. Policy and Action Standard Final Draft for public comments.* Available at http://www.ghgprotocol.org/files/ghgp/GHG%20Protocol%20Policy%20and%20Action%20Standard%20-%20Second%20Draft%20for%20Pilot%20Testing.pdf
- Würtenberger, L (2012) *Financing Supported NAMAs (Nationally Appropriate Mitigation Actions).* Discussion paper, ECN Policy Studies. Available at http://www.mitigationmomentum.org/downloads/Financing_Supported_NAMAs.pdf

# Impressum

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany
T +49 228 44 60-0 (Bonn)
T +49 61 96 79-0 (Eschborn)

Friedrich-Ebert-Allee 40
53113 Bonn, Germany
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-11 15

E info@giz.de
I www.giz.de
I www.transport-namas.org

Authors:
André Eckermann, Andrea Henkel, Oliver Lah,
Urda Eichhorst, Daniel Bongardt, Laura Wuertenberger,
with input by Daniel Sutter (INFRAS) and Henri Chua
(IM Technologies Unlimited)

Managers:
Andrea Henkel, André Eckermann, Insa Eekhoff

Layout:
Julia Klasen

Photo credits
Stefan Bakker, Daniel Bongardt, Manfred Breithaupt,
Jerome Buis, Alejandro Garcia, Vedant Goyal, Andrea Henkel,
Cornie Huizenga, Santhosh Kodukula, Florian Kopp, Gerhard
Menckhoff, Christian Mettke, Carlos F. Pardo, Ko Sakamoto
and Dominik Schmid

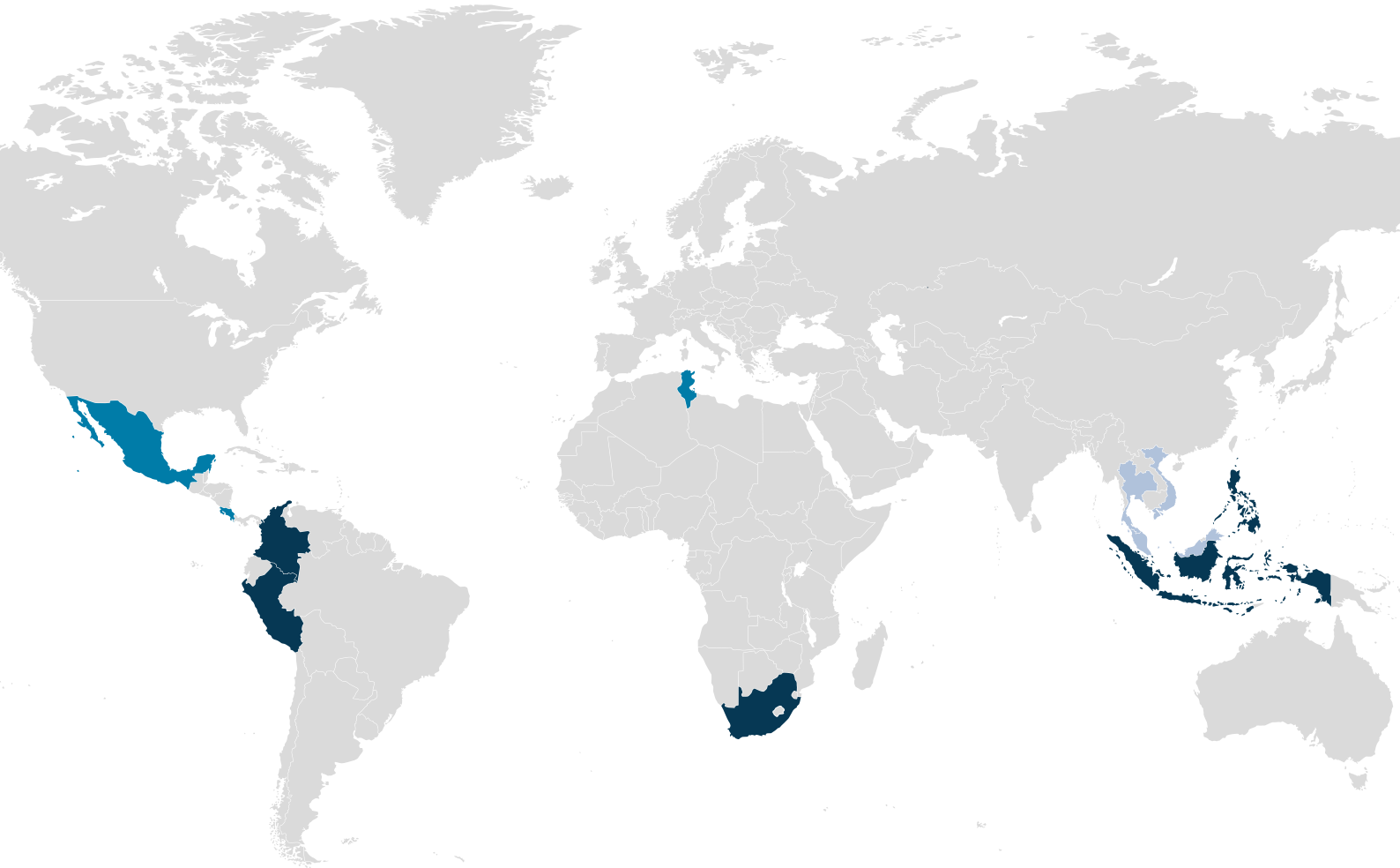
Printed and distributed by:
Eschborn, Germany, November 2015

Suggested citation:
GIZ (2015). Navigating Transport NAMAs. A practical handbook
on Nationally Appropriate Mitigation Actions (NAMAs) in the
transport sector. 2nd revised edition. Eschborn, Germany.

On behalf of:

Federal Ministry
for the Environment, Nature Conservation,
Building and Nuclear Safety

of the Federal Republic of Germany



Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Sitz der Gesellschaft
Bonn und Eschborn

Friedrich-Ebert-Allee 40
53113 Bonn, Germany
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-11 15

E info@giz.de
I www.giz.de
I www.transport-namas.org