Biomass Energy Strategy (BEST)

Outline

A Guide for Policy Makers and Energy Planners

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Partnership Dialogue Facility (EUEI PDF)

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Federal Ministry
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BEST is a joint initiative of the *EUEI Partnership Dialogue Facility (PDF)*, GTZ's *Energising Africa* programme and the *Household Energy for Sustainable Development (HERA)* programme (both implemented on behalf of BMZ). It is based on the findings of a workshop which was hosted by the SADC-based *Programme for Biomass Energy Conservation (ProBEC)* in March 2004 and involved most SADC countries. The initiative responds to the need for a more strategic approach to address the problem of how to scale up access to clean cooking fuels that has been repeatedly expressed by several other national governments and regional organisations such as the East African Community (EAC).

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List of abbreviations

BEST	Biomass energy strategy
BE	Biomass energy
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Ministry for development cooperation)
ESDA	Energy for sustainable development (Research organisation)
GHG	Greenhouse gas
GIS	Geographical information systems
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German agency for technical cooperation)
IBT	Improved biomass technologies
LPG	Liquid petrol gas
MDG	Millennium development goals
SME	Small and medium size enterprises

The BEST initiative
What is the relevance of this guide?

What is the BEST initiative?

The Biomass Energy Strategy (BEST) initiative supports African governments in developing national biomass energy strategies. The goal is to ensure a more sustainable supply of biomass energy, meeting the demand of the people and various sectors of the economy. The initiative aims at building awareness of biomass energy as the main source of primary energy in Africa and its relevance to poverty alleviation, in particular among decision makers at the policy level and other important stakeholders. The target is to finalise a strategy development process in a number of countries within two years (2007/2008), resulting in a draft strategy ready for Government approval. At the same time the BEST approach will be further developed and adapted for dissemination and application in other countries.

Why biomass energy strategies?

Biomass is the main source of primary energy in sub-Saharan Africa. In some countries wood fuels (firewood and charcoal) or agricultural waste account for more than 90% of total energy consumption. The wood fuel sector not only employs tens of thousands of people, it also contributes millions of dollars to local economies in the form of revenues, taxes, and incomes. However, as it is seen as “traditional”, it is seldom given high priority in energy policies and poverty alleviation strategies. While White Papers for the power and petroleum sector exist in most countries, there are few comparable strategies for the traditional use of biomass in the energy sector, in particular in Eastern and Southern Africa. Some countries have implemented isolated projects to demonstrate action and some have given it new attention by assigning biomass to the “renewables” sector, but normally commitments remain verbal (appearing on the “last slide” of presentations at energy conferences).This is all the more precarious as in many African countries biomass energy consumption has reached a stage where it is no longer sustainable. In many regions the increasing demand can no longer be satisfied as forest resources disappear. The intra biomass transition from firewood to charcoal, on top of the low efficiency of carbonisation technologies, is accelerating this process: in many countries the “fuelwood gap” has become a reality or at least has appeared on the horizon. Moreover, as oil prices rise the heavy dependence on biomass is not expected to change dramatically over the next couple of decades.

Key to overcoming this situation is to give biomass energy higher priority in national energy policies. The development of biomass energy strategies as proposed by the BEST initiative will have the following positive effects:

- A formal strategy development process will help to shift public attention to an issue that affects the majority of the population. It will create awareness and a greater acceptance of the need for intervention.

- Crisis management can only help to resolve short-term bottlenecks, but not any structural problems. A biomass energy strategy is the basis for long-term planning and interventions, in particular on the supply side (e.g. reforestation), where results can be expected only after several years.
- Biomass is mainly a public resource that is accessible to everybody. Once the market reacts to degradation of natural resources (e.g. by increasing prices for wood) it is often too late for corrective action. A biomass energy strategy has to provide preventive action, built on mid- and long-term scenarios.
- Biomass energy is a cross-cutting issue. Only co-ordinated and strategic action involving different sectors (e.g. energy, forestry, rural development, protection of natural resources and health) and stakeholders will guarantee that policy interventions are accepted.
- Biomass energy is a sensitive policy field. Radical interventions such as regulations for fuelwood supply or consumption affect the poorest, often leaving them without alternatives. A biomass energy strategy has to pull resources and institutions together in order to provide sustainable and affordable options for the poor, and to demonstrate that energy policy does not only concern the richer parts of the population.
- The introduction of new, efficient technologies and methods (e.g. improved stoves or kilns) and/or alternative fuels requires a supportive policy framework in order to reduce the incremental costs and promote sustainable options to the point where they can be disseminated by market mechanisms.

What are main barriers for a sustainable management of the biomass energy sector?

Past experiences in some African countries with biomass energy programmes and initiatives have led to the following findings:

Perception: pre-occupation of policy makers with power sector and liquid fuel supply issues; insufficient attention and a low priority given to biomass energy on the policy level.

Financial: biomass energy is largely an informal sector activity with long gestation periods, small profit margins, not attractive to large capital, lack of financial appeal, reluctance of financial institutions to finance biomass-related projects (except for biofuels/co-generation projects); due to large capital investments, biofuels attract attention at energy policy level.

Information: lack of comprehensive and reliable data; figures and facts about the central role of biomass energy are not documented; responsible institutions lack financial and human resources and often have a marginal role.

Technological: few producers of proven BE technologies, lack of knowledge about the availability of these technologies, their advantages and constraints amongst consumers, little knowledge about advanced technologies for modern brick and charcoal kilns; lack of quality control and regulation.

Human resources / Institutional: shortage of qualified personnel/ experts in the area of BE, BE often only a small component in activities of key

institutions; weak collaboration and institutional linkages between actors, scarce availability of financing mechanisms, relatively low price of BE.

What does the BEST initiative offer?

The BEST initiative fosters national strategy development processes by various means, including regional workshops. The philosophy is not to offer universally valid solutions, but to assist teams from different countries in developing country-specific strategies together with all relevant sectors and stakeholders. To this end, the BEST initiative offers:

- Support for the national strategy development process and for local facilitators and consultants
- Methods to identify key challenges in each country and tools for developing scenarios
- Support for team-building and for designing national stakeholder dialogues
- Organisation and moderation of regional workshops to enhance the exchange of experiences between the participating countries

Long-term energy planning and modelling programmes that examine the impact of integrating biomass energy into mainstream energy development plans and projections can contribute to a more sustainable and secure energy supply in Africa. There is a need to build local capacity for analytical expertise to provide comprehensive long term evaluations of available biomass energy production options.

Previous strategy development processes have shown that full political commitment and “ownership”, as well as stakeholder involvement, is crucial to the **successful development and implementation** of a strategy. A strategy is not only a political document, but also a process that helps to create awareness and consensus amongst the stakeholders. Therefore, the way in which the strategy development process is designed in each country will have a direct influence on the success and impact of the strategy. Key factors are:

- Commitment and ownership of the decision makers at the political level
- Involvement of relevant sector Ministries
- Capacity building at the technical level of the Ministries, with a focus on the design of a national strategy development process
- Sufficient time to involve relevant stakeholders at the national and regional levels and to communicate the strategy's objectives and contents

What is the objective of this guide?

The **objective of this guide** is to give policy-makers and energy planners an orientation for the development of a national Biomass Energy Strategy (BEST). It defines strategy development as a **systematic and ongoing process** that follows a consultative and participative approach.

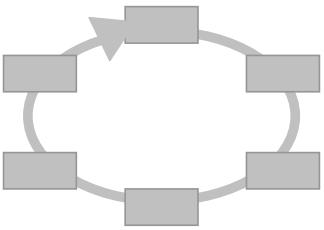
The purpose of this development process is to **establish a coordinated framework** of short-term, medium-term, and long-term interventions to reach a sustainable management of biomass energy resources and the

provision of better energy services to the people. This framework will combine energy and forestry activities (demand and supply). Of course, each country has its own specific needs which will shape its strategy, and the choice between options will be made by the actors involved in the strategy development process.

The scope of the BEST-Guide is the **thermal use of biomass energy** for households, institutions and small and medium enterprises. However, other areas of biomass energy should be included in the strategy if they are relevant for the specific country.

The guide describes the main steps of this process with their objectives and key elements, presenting examples and important questions to be answered. However, it should be viewed as a **flexible instrument** which can be improved and expanded. It does not propose a rigid framework that can be applied in all countries. Despite certain similarities between and within African countries, there are differences, particularly in the availability of biomass resources. The possible approaches are not necessarily the same everywhere. The guide is therefore a general framework providing direction in developing a BEST, which should be **adapted** to the country context in order to accommodate and reflect country-specific priorities and needs. Consultation and discussion with various stakeholders at each stage of the development process are of vital importance, and at times it will be necessary to review the process and make adjustments.

This BEST Guide has been developed on the basis of the background documents and findings of the first regional workshop on Biomass Energy Strategies (BEST), held in Dar-es-Salaam on 12-14 September 2006. It is based on the PREDAS Guide to Develop National Household Energy Strategies, the Policy and Strategic Management Toolkit derived from the GTZ-ProBEC Biomass Energy Strategy Development Workshop held in 2004, the Uganda Biomass Energy Demand Strategy (Draft) and the Draft Outline on Biomass Energy Strategies developed by ESDA.



Developing a BEST - What are the main steps?

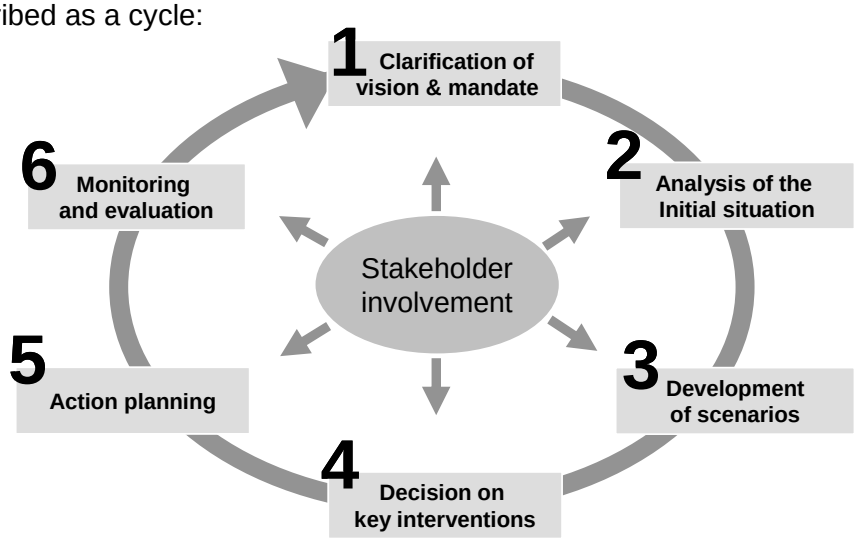
A strategy describes the key interventions of an organisation or a government institution to achieve policy aims. While **policies** address challenges and set goals for change, **strategies** analyse the different options how to reach the goal, propose the appropriate intervention lines and set out concrete actions by which the goals will be achieved. A strategy is not a blueprint but rather a set of concepts to facilitate decisions and take actions for implementing a policy.

Policies address challenges and set the final goals, strategies describe the way how to reach them

A strategy answers the following questions:

- What is the final goal and who defines it? (vision and mandate)
- What is the problem and who is involved? (analysis of initial situation)
- Which way is the best to reach the goal? (scenario development)
- What has to be done? (decision on key interventions)
- Who does what by when and with which resources? (action planning)
- How can the results be measured? (monitoring and evaluation)

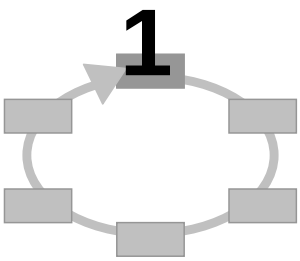
The development of a BEST follows a **systematic approach** which can be described as a cycle:



The BEST cycle is a systematic step by step approach for strategy development.

Each step is crucial for the success of the process. If, for instance, the analysis of the actual situation has not been done carefully, actions might be developed which have no impact at all or even a negative impact. Without a proper development of scenarios it is difficult to define realistic targets for the future. And without a detailed planning of actions, involving relevant stakeholders and attributing sufficient resources, the strategy will never be implemented. Finally, without systematic monitoring and evaluation nobody will ever be able to state if the strategy has been successful or not.

The **process of developing a BEST** is at least as important as the final strategy paper. The aim should be to reach a common understanding amongst the stakeholders and a consensus on necessary actions. At each step, discussions should be organised between the actors concerned in order to collect their responses and observations.



Vision and mandate

What is the final goal and who defines it?

Biomass energy is a very broad, cross-sectoral topic, concerning a multitude of actors and dealing with complex systems. The first step when developing a biomass energy strategy (BEST) is to determine its overall vision and to define a clear scope of the strategy.

1.1 Vision and objectives of a biomass energy policy

If a strategy describes the way to a **final destination**, it has to be very clear from the beginning where this destination is. Without a clear vision, even a detailed and proper planning process can lead to wrong results. Setting broad, long-term objectives serves as a reference for strategy formulation and helps to focus on the main areas of intervention at a later stage. It may be necessary to go back and review these objectives while moving ahead in the strategy development process.

Biomass energy can only be sustainable if demand does not exceed supply.

A biomass energy strategy (BEST) should aim at a socially, economically and environmentally sound use of resources. This requires balancing the supply and demand of biomass energy. **Sustainability** is given only if demand does not exceed supply. The adverse effects of an unsustainable use of biomass energy resources are already becoming apparent in many countries: resources are declining, forests are being degraded at an alarming pace, and prices for fuelwood and charcoal are rising sharply. If existing, the vision should build on an existing framework such as the PRSP and the national energy policy.

The **vision** describes the desired situation in the long term (15 to 30 years). It should include a qualitative statement on all involved sectors and address economic, social and environmental impacts.

Example: Access to sustainable, affordable and clean cooking energy for all households, institutions and private sector by 2030, based on locally grown trees, plants and alternative fuels such as LPG.

International agreements and goals can also give a helpful orientation.

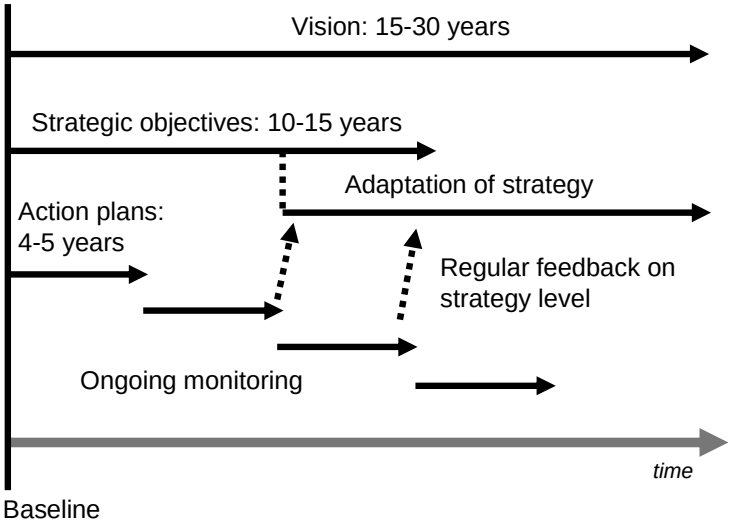
Biomass energy and MDGs

The Millennium Project, which emphasizes that access to energy is essential for achieving all of the MDGs, calls on countries to adopt the following target: ‘By 2015, to reduce the number of people without effective access to modern cooking fuels by 50 percent, and make improved cookstoves widely available’.

Based on the vision, the **strategic objectives** for supply and demand of biomass energy as well as alternative fuels need to be defined. The objectives should be precise, realistic and measurable over a defined timeline by clearly formulated (quantified) indicators.

Example: By 2015, 80 % percent of the rural population uses improved biomass energy technologies or LPG for cooking.

The objectives of the BEST should be in line with the country's **developmental objectives** such as economic growth, improvement of living conditions and sustainability. Reference should be made to existing government strategies and policies relevant for biomass energy (e.g. PRSP, National Energy Policy, National Forestry Policy).



Helpful questions are:

- *How should the household energy supply look like in the future? What is the ideal energy supply system in the country?*
- *How shall biomass energy be used? Which improvements are desirable?*
- *How should the biomass energy market look like in the future?*
- *What do we want to achieve in the long run? Stabilising the current situation and making it more sustainable vs. shifting to other energy resources?*
- *What major changes should be promoted?*
- *Is the vision in line with the objectives stated in these documents? Or do these documents even need changes or amendments?*

1.2 Clarify the mandate and roles

In order to assess what can be achieved with a BEST, it is important to clarify what relevance the strategy has in the national context, what its mandate is and who needs to be involved in its development.

There has to be a **clear statement of political will** and a strong backing from the involved Ministries for the BEST process. This has to be reflected in their **active and leading role** in the strategy development process.

The following approach is suggested:

(a) Clarify roles and responsibilities. It has to be clarified at the beginning who is driving the process. As it is an energy strategy, this would normally be the Ministry of Energy. In addition, the role and participation of different sector ministries (e.g. ministry in charge of forestry, agriculture or other relevant sectors) has to be defined.

(b) Identify relevant actors who have an interest, or can affect the supply or demand of biomass, and include representatives of these groups in the decision making process (e.g. state bodies, private sector, civil society, research institutions, etc.).

(c) Form a core group (BEST team) that will lead the strategy development process with representatives from key stakeholder groups.

The BEST team coordinates the process of strategy development.

(d) The BEST team should be accepted or given a mandate by the key stakeholders. It will be responsible for coordinating the BEST development process.

(e) Ensure close cooperation and coordination with those which are not members of the core group.

The **involvement of all relevant stakeholders** in the strategy development process is a precondition for a successful implementation of the proposed actions. It is envisioned to improve coordination between different actors, help to address conflicts at an early stage and create synergies with other policy processes. It will also create awareness and ownership ensuring that proposed interventions are feasible, and will result in the opportunity to assign responsibilities for implementation. A transparent organisational framework representing relevant stakeholders is highly recommendable.

The BEST team

The core team consists of 2-3 decision makers (in particular from the Ministries of Energy and Forestry; Environment, Agriculture and Rural Development Ministries could also be involved). They are supported by technical staff and consultants. Other important stakeholders, such as NGOs, private sector institutions and donor agencies, will be involved as well, participating in surveys, workshops and planning sessions.

The BEST team gets support from four sides:

1.3 Determine the scope, time horizon and process

The field of biomass energy covers a wide range of applications and options, and not all of them will be applicable to the specific circumstances

of each country. In some countries only certain regions suffer from shortages of biomass energy. Others have specific technological interests, e.g. a high potential for biogas or biofuels. In some countries alternative fuels are a realistic option on the short-term, in others not at all. Therefore, it is important to define the **scope** of the BEST at the beginning of the process. The scope determines what key sectors will be covered, as well as the level of regional planning (national or province level, or a specific geographic focus). The BEST initiative recommends

- a focus on the genuine, specific problems in each country and certain regions within the countries,
- taking the needs of biomass users as a starting point,
- analysing both the demand and the supply side of biomass energy, while considering natural resource management,
- concentrating on the use of thermal energy, but also considering future options for using biomass energy for other purposes, such as biofuels for electricity
- considering alternative fuels to substitute biomass energy where it is becoming scarce and no longer a sustainable source of energy,
- abandoning the "business as usual" approach, rather focusing on scaling-up and the widespread dissemination of effective forms of intervention.

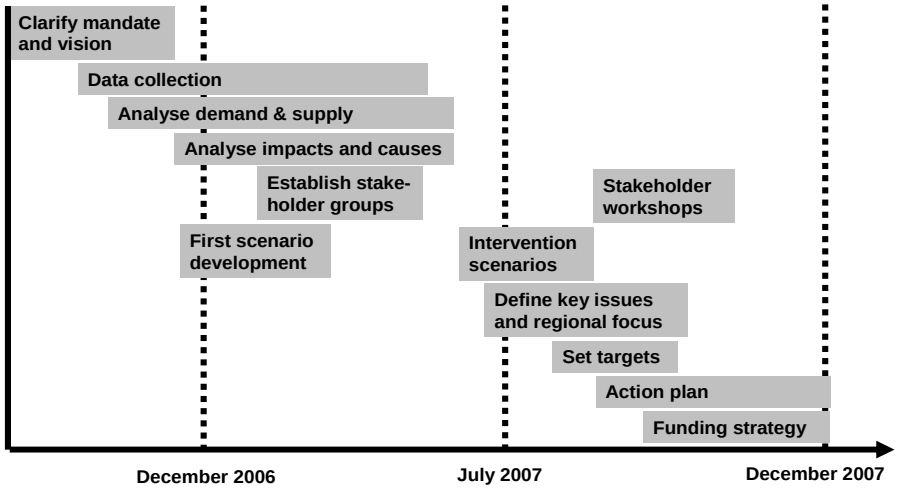
The development of **biofuels for transport** is a separate subject that needs separate treatment. It needs to be taken into account when looking at the availability of land for fuel for heat for household and small industrial use.

The **time horizon** of the BEST depends on the focus of the policy, on which it is based, e.g. to resolve an urgent problem or addressing long-term goals. The “timing” of the political system might also be important, dates of elections, periods of national development planning etc.

Helpful questions are:

- *What is the scope of the strategy? Which areas are included, which are not?*
- *What are strategic areas the BEST will focus on?*
- *Who will use the BEST? To whom is it addressed?*
- *Which binding financial commitments does the BEST include? Does it have any regulatory requirements or legal implications, or does it serve more as a guideline?*
- *What is the time horizon for the BEST (5, 10, 20 years)?*
- *Are the main goals of the policy short-term or long-term goals?*

It is important to define a **map of the strategy development process**: Which are important "milestones" such as workshops or other events with participation of relevant stakeholders or public? When can which results be expected? How long will data collection take? It can be helpful to design a rough time schedule for the process, so that all stakeholders have a clear perspective about their involvement.



1.4 Assessment of necessary resources

Without sufficient resources, a strategic process cannot be concluded successfully. Thus, at the beginning of the BEST process, the necessary and available resources should be assessed. This includes:

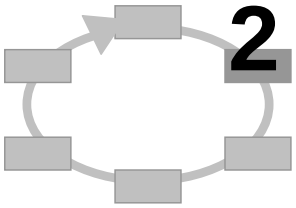
- Financial resources
- Human resources
- Time resources

Without sufficient resources the BEST process cannot be concluded successfully.

The strategy development is likely to require several months of expert time – perhaps consultants and time from those commissioning the strategy and from other stakeholders to be engaged in a steering committee, take part in workshops etc in order to arrive at an agreed and realistic document.

Helpful questions are:

- *Who contributes to the development of the BEST?*
- *Which costs have to be covered during the process (consultancy, surveys, events, publications)?*
- *Who within the involved institutions has the knowledge and capacity to actively participate in the BEST process?*



Analysis of the initial situation
What is the problem?

A careful assessment of the initial situation at the national and regional level (within one country) is the starting point for developing any BEST. This will delimit and objectively define all relevant issues related to biomass energy, as well as facilitating the identification of entry points for possible interventions. A complex set of economic, social, demographic, political and other factors influences the biomass energy situation. To learn about the structural characteristics of biomass energy, it is necessary to identify the trends, factors and driving forces that affect energy demand and supply. This analysis should for example deal with the true economic impact of the sector, consumer preferences, problems related to the development and organisation of networks, institutional weaknesses or shortcomings, cost distortion and trends, relationships between and interests of key stakeholders.

2.1 Data collection

Apart from the qualitative analysis, a quantitative assessment is a prerequisite for measuring progress during the implementation of the strategy (baseline). Many African countries do not have reliable data on traditional biomass energy supply and use. Even when data on biomass energy do exist, very often they are not linked with each other and imbedded in the energy policies. **Stakeholder consultation** can be an opportunity to create a pool of useful information as a basis for further analysis.

Use estimates if necessary.

It is better to be roughly right than precisely wrong!

In many cases, additional data collection might be necessary. However, going into great detail will be very time consuming and costly. It is imperative to decide which data is essential for the BEST development and which can be neglected. In some cases **sample surveys** and **robust estimations** might prove more useful than lengthy research initiatives. For those necessary data aspects that can only be estimated, reliable methods for estimating should be developed.

It is important to underline the **regional (local) character** of biomass energy supply systems. Aggregated national data might give a first impression about problem areas and necessary interventions. However, to understand the complex interrelation between different parameters and to plan successful interventions, it will be necessary to assess the respective regional and even local data. It is important to be clear that the situation will widely vary across the country.

2.2 Socio-economic analysis

Starting point for the analysis are general **demographic parameters** such as

- population size and density / distribution
- projected population growth rate
- distribution of population in urban vs. rural areas
- urbanisation / migration rate

This information is the basis for the actual and the expected number of people which have to be supplied with energy.

To describe the structure of the informal and formal biomass energy market, the following **economic parameters** are important:

- average income of households
- share of household income spent on energy
- type of local economy (subsistence, market based)
- firewood and charcoal production and trade,
- production / sales of improved stoves and modern cooking equipment
- employees and turnover of (formal and informal) biomass energy sector

2.3 Demand for biomass energy and alternative fuels

Regional analysis is necessary to identify important consumption centres.

Balancing the supply and demand will indicate how sustainable biomass energy sources are being used or how severe the situation is in regard to affordability of energy, deforestation, price increases etc. Even if there is no imbalance at national level, certain provinces might suffer from deficits. In the analysis, wood energy supply areas, consumption centres and the energy flows between them have to be identified. Interventions will be carried out accordingly.

The demand for biomass energy can be described with the following parameters:

- **user categories**: urban and rural areas, formal and informal sector, different income groups, big and small industry
- **consumption purposes:** cooking, heating, lighting, small businesses, industrial use
- **fuel types**: quantities consumed (agricultural residues, fuelwood, charcoal, LPG, kerosene, electricity, others), typical fuel mix of households, share of each source of energy (per household / in industry / total), utilisation costs
- **technologies used:** types (traditional stoves, improved stoves, others), availability, efficiency (fuel / cost savings) (see Annex IV)

Assessing **alternative uses of biomass** will indicate competing areas, thereby identifying the additional pressure on biomass resources. In many regions, the supply with biomass energy is not affected mainly by the overuse of biomass for household energy supply, but by other uses (e.g. brick production, which sometimes accounts for one third of biomass consumption in certain regions). Thus it is important to include in the analysis competing uses of biomass and other factors which have additional impact on the forest cover, for example

- construction
- furniture production
- export of wood/ wood products

2.4 Biomass energy supply

The concept of sustainability is that the annual extraction should not exceed the mean annual increment. Total biomass consumption and production flows should be summarised at national and regional level, identifying important biomass **supply areas** and **consumption centres**. The assessment of biomass energy supply should be both qualitative (descriptive) and, where possible, quantitative. Useful instruments to visualize the main parameters, highlighting areas with surplus, deficit or balance, are biomass energy maps. Geographical information systems (GIS) can be helpful too, if available.

The following parameters are relevant for biomass energy supply:

(a) Availability and use of resources

- Land or forest cover (use) distribution and biomass production
- Main supply sources (regional analysis, mapping)
- Mean annual increment, rotation time, planting area (which cannot exceed available land) and woodfuel share[1], sustainable yields,
- Woody biomass availability (subtract areas that are too remote to be accessible or are subject to restrictions, such as forest reserves, game reserves and national parks)[2]
- Land clearing for agriculture, housing construction or transport infrastructure
- Afforestation rate, fuel plantations
- Changes in forest cover due to climatic changes (e.g. desertification)

(b) Agricultural residues and animal wastes[3]

- Biomass energy from crops can be derived from agricultural residues arising from the growing, harvesting and processing of both food crops and cash crops
- Timber waste
- Assessment of animal wastes
- Barriers to usage

[1] Woodfuel share means the percentage of wood yield that is used for cooking and heating while the rest remains within the forest or will be used for e.g. construction or furniture.

[2] In the case of fuelwood, it should be noted that normally only small stems, twigs and branches are utilized.

[3] Data on residues are in most cases lacking. In Uganda, the data for residues were derived by calculating the production figures of each crop with appropriate conversion factors (residue-production ratios). The conversion factors were obtained from a report for GHG inventories. In some areas of Kenya, for instance, this covered nearly 80 % of woodfuel requirements.

(c) Management of the biomass resources

To plan successful interventions for improving the supply with biomass energy, it is important to analyse land ownership and management issues.

- Who manages the resources?
- Is land ownership private, communal, or by the state? Who owns the biomass resources (not necessarily the same who owns the land)?
- Is it centralised or locally managed (e.g. community forest management)?
- Do stakeholders (e.g. rural communities) participate?

It is helpful to classify the ecological, social and economic factors that determine the exploitation of wood.

Rural communities

To analyse the mechanisms in supply areas, in sample communities participative appraisals should be conducted to understand how farming communities value different tree species for different purposes. What are their motivations for conserving trees for fuel and other purposes? Do they see fuelwood supply as a problem? Do they see a market for growing fuelwood or producing charcoal? What constrains them from growing more fuelwood? Do they consider they have rights over fuelwood collection on their land? Can those rights be violated by others? What are the competing uses of agricultural "wastes" – e.g. fodder, fuel, mulch?

(d) Supply chain analysis

For a deeper analysis it is necessary to quantify biomass energy flows to consumption centres and describe the respective networks' sociology and economy (especially in the charcoal sector), breaking down of prices at different points in the chain, comparing informal vs. formal producers and the technology used for production.

(e) Alternatives to biomass energy

Especially in urban consumption centres, alternative fuels such as liquid petroleum gas (LPG), kerosene and electricity, but also gel fuel or biofuels for cooking can play an important role to reduce the demand for traditional biomass energy. It is important to analyse their

- Availability and reliability
- Utilisation
- Adoption factors
- Costs of fuels and utilization devices / affordability
- Potential for local production (formal and informal sector)

Main barriers for their utilisation have to be identified.

2.5 Major trends

Analysing trends helps to identify future problems that might not yet be visible at this stage.

Besides gathering data of the present situation, knowing **existing trends** is crucial to understand the problems and identify key interventions. For instance some cities/towns are supplied by a surplus area of biomass, but are experiencing a rapid transition from firewood to charcoal or from charcoal to LPG. Interventions have to be designed accordingly in order to maintain the balance.

Important trends to be analysed are:

- Population growth and urbanisation rate
- Development of household income
- Conversion of forest areas to alternative land uses (e.g. agriculture)
- Fuel switches / shifts on the energy ladder (up or down)[4]
- Price of biomass energy and modern cooking fuels
- Use of improved stoves and kilns

2.6 Policy, institutional, legal and regulatory conditions

Analysing the policy, institutional, legal and regulatory conditions will help to identify existing successful instruments and barriers for a sustainable use of biomass energy. At the same time it helps to assure that the BEST is compatible to other policies (e.g. national or regional energy access strategies and action plans, national energy policy, national forestry policy, national forestry programme, donor- or government-funded household energy or forestry projects etc.). Ideally, BEST will serve as a tool to harmonise existing strategies from different sectors that address biomass energy issues and build upon existing experiences. It can also learn from the achievements of current or previous projects in other countries, particularly those with similar frameworks.

First of all, an **overview** about the national institutional, legal and regulatory conditions is needed. The following areas should be analysed:

- Financial / fiscal aspects (subsidies, taxes etc.)
- Institutional settings (related policy documents, effectiveness, enforcement, consistency)
- Regulatory and legislative framework for the woodfuel and charcoal sector and ownership and rights issues – experience of community forestry or woodlots.
- Government departmental responsibilities – which ministry is responsible for what kind of issue/ area?
- International agreements / regulations concerning the management of natural resources, including cross border issues

[4] The energy user shifts from one type of energy to another according to the **"fuelwood ladder"** (dung, firewood, charcoal, LPG/kerosene, electricity) as household incomes increase.

The next step is a **review** of these policies and current initiatives, analysing the achievements, relevance, main obstacles and important lessons learned (e.g. improved stove/oven/kiln dissemination projects, projects promoting alternative fuels, energy conservation projects, agro-forestry projects, rural electrification projects). Donor activities in the involved sectors (approaches, priorities) should be considered as well.

Helpful questions are:

- *What initiatives, programmes and policies (completed, ongoing or pending) are dealing with biomass energy or other relevant areas on the regional, national and local level?*
- *What are their main activities, areas of intervention and time lines?*
- *Who is responsible and who was involved?*
- *Are there new initiatives, projects or programmes planned for the future? In which areas, what are the objectives?*
- *How can they be linked to the strategy?*

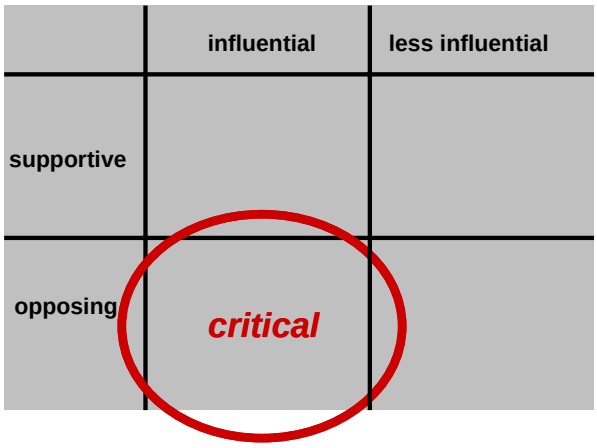
2.7 Stakeholder analysis

Involving relevant stakeholders in the BEST process is a precondition for its success. This must already begin during the analysis of the initial situation: only with the participation of research institutions, experts and organisations who work with rural communities a realistic understanding of the problems and opportunities in the field of biomass energy can be achieved. Involvement also creates awareness and ownership. The implementation of the planned interventions requires active participation and support by different stakeholders, This can only be expected if their interests have been considered during the planning phase. Therefore, sharing of information and discussion are integral elements of the process at all stages.

Definition of the term "stakeholder": A stakeholder is a person, group or organisation that has a legitimate interest in a project or entity. This includes everyone with an interest (or "stake") in what the entity does or who is affected by its output.

There is a **diverse set of actors** that have a stake in the biomass energy sector (see Annex III), and some of them have conflicting interests. Some will support planned interventions, others might be against it. An understanding of organisations and actors in the biomass energy sector, their interests and contribution to potential interventions is necessary during the development of the BEST. With a simple tool, the most critical group of stakeholders can be identified: those who are influential but opposing (see graph). These groups in particular have to be addressed and involved in the process.

When planning concrete actions, all relevant stakeholders / stakeholder groups must be duly identified with **clearly and jointly defined roles**. All interventions must contribute to preserving an objective balance: each actor must be able to benefit from his/her activity while at the same time a sustainable demand and supply of biomass energy and alternative fuels is assured. This work is even more important in the biomass energy sector, where supply networks are essentially informal and therefore fairly resistant to change.



Above all, planning demand and supply of biomass energy should **involve end-users**. Special attention should be devoted to involving women, because they bear the burden of the traditional use of biomass energy and are likely to be the greatest beneficiaries of improvements on both the supply and demand side. Given the local implications of biomass energy use, decentralisation of rural energy planning is wise. Consequently, an assessment of the demand and supply flows and of desirable interventions must adopt the same geographical scale. Because of their thorough knowledge of the local situation, local people – women in particular – can be an integral part of the solution.

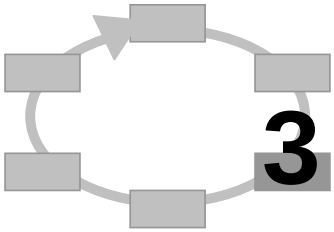
How and at what stage stakeholders are involved should be carefully considered. The core group for developing the national BEST (BEST team) has to decide which stakeholders are most relevant and need to be involved in the BEST process at which stage. Not everyone needs to be involved at all stages.

Summary for policy makers

After having completed the analysis, it will be useful to produce a **qualitative summary** of its findings. The conclusions that result from the analysis will indicate how relevant the topic is and will highlight key issues of the biomass energy situation. In particular, it should be possible to answer the following qualitative questions by evaluating the quantitative results:

- What are main biomass energy issues in your country?
- Is there a problem (deforestation, indoor air pollution and other health issues, economic impact, illegal charcoal making, etc.)? If yes, how significant is it?
- Who are the most affected stakeholders?
- Which are the regions most affected?
- What are the main obstacles to a sustainable BE sector? Identify categories.
- How can the BEST be integrated into the overall energy strategy?

Defining the key issues of the current biomass energy situation and the main barriers to sustainable biomass energy demand and supply will enable the BEST team to determine focal areas of the BEST in the next step. It will also emphasise the relevance of the sector for national development and can serve as a justification for developing a BEST (rationale).



Scenario development
What will happen if …

Strategic planning means to analyse the impact of current decisions on future developments. The development of scenarios is a method of simulating possible future situations. Considering different interventions, the key question is to ask “what will happen in the future”, starting from now. Analysing these scenarios facilitates taking a decision on either leaving everything as it is or intervening in order to influence the future development.

3.1 Define the size and key performance indicators

The analysis of the current situation delivers the key parameters for the development of a trend scenario which describes the likely or desired development of supply and demand of biomass energy over the long, medium, and short term, as well as the environmental, socio-economic, and financial impacts on the biomass energy sector. The model used for scenario development should be limited to a manageable size. The areas to be covered in the BEST have already been defined. It is important to find meaningful key indicators to analyse and evaluate the impacts of possible interventions on future developments.

Computerized tools for scenario development such as the GTZ simulation model on biomass energy might prove helpful. However, the results are only as good as the data used. These models always have to reduce the complexity of the real situation, excluding several factors which might be important. It is recommended to use qualitative tools as well to cross-check the results of the simulation models.

Helpful questions are:

- *Which parameters serve as indicators for a sustainable supply with biomass energy?*
- *What kind of information is missing to develop or concretise the scenario? Can this information be collected in the short term?*
- *Which parameters are strongly interrelated?*

3.2 Baseline (business-as-usual scenario)

Based on the analysis of the initial situation as described in chapter 2, the likely future development of biomass energy supply and demand is projected over a defined period, without changes in policy or other interventions (business-as-usual scenario). Key parameters indicate short-term, mid-term or long-term shortages and other problems in the supply with biomass energy. The baseline scenario indicates the urgency of interventions and priority areas.

Additional scenarios can be developed based on trends which can hardly be influenced by the involved actors (even by the Government), e.g. the

development of the oil price, the population growth or the international demand on biofuels. These scenarios show the **range of possible impacts** on the long-run, the limits of what can be expected and of what the respective Government and other stakeholders have to be prepared for.

3.3 Evaluate alternative scenarios

Scenarios facilitate the decision on possible interventions.

The development of alternative scenarios allows the evaluation of the impact of different intervention approaches. Based on assumptions the expected changes are estimated and compared if one or several interventions would be implemented. This is – besides the costs of the intervention – the main argument for the selection of an adequate intervention line.

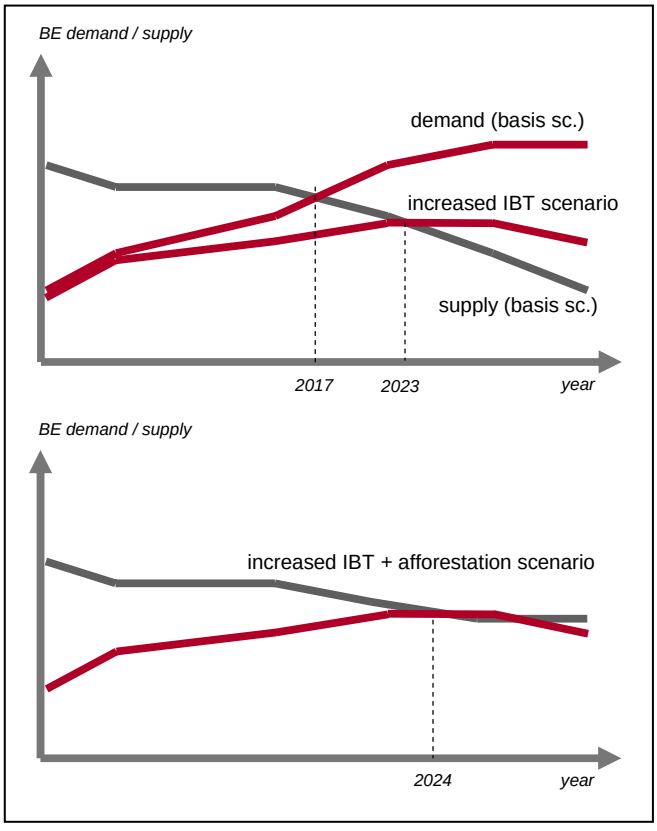
Possible intervention scenarios include:

- Promoting the efficient use of available forest resources
- Increasing the availability of wood fuels, e.g. through afforestation
- Promoting the fuel-switching to alternative non-biomass fuels such as LPG, kerosene or biofuels for cooking
- Reinforcing the coordination and consistency of management initiatives in the sub-sectors
- Promotion of more advanced technologies (e.g. improved stoves, efficient charcoal production)
- Empowering communities to manage their land biomass energy resources in a more sustainable way
- Command and control of resources (e.g. limitation of charcoal supply by government regulation on different levels)

In the example, the development of biomass demand and supply are shown for the next years. In the basis scenario, in 2017 the demand for biomass energy surpasses the available resources.

The alternative scenario shows that the promotion of improved biomass energy technologies (IBT) helps to reduce the biomass consumption, however, not enough to avoid that the demand surpasses the supply in 2023.

In the third scenario, increased IBT is accompanied by afforestation programs. It shows that biomass energy supply can be stabilized on the long run.



For the different scenarios, the development of key indicators is analysed, comparing with the baseline scenario. Of course, the interrelation between these indicators is complex and perceived differently from different positions. At this stage it is crucial to involve relevant stakeholders and agree upon the importance of the specific indicators. Computerized programmes for scenario development can only be a tool to prepare decision making. They can not replace a qualitative discussion and balance between different opinions.

The following parameters might be useful indicators to evaluate the impact of each intervention:

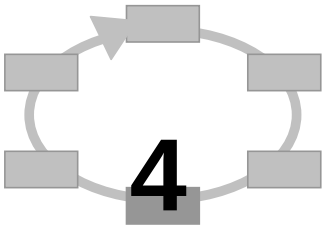
- Share of households without sufficient (cooking) energy supply
- Fuel wood supply / (accessible) forest cover
- Energy consumption of different groups (urban/rural, poor/rich, different regions)
- Average percentage of household budget spent for energy
- Average time households spend for satisfying energy needs
- Fuel-switching along the energy ladder (from fuelwood to charcoal to LPG to electricity or back)
- Utilisation of improved biomass technologies
- Dependence on imported energy
- Indoor air pollution in households

The example in the table below shows how the impacts of different scenarios can be presented and compared:

In 2015 :	Scenario A (business as usual)	Scenario B (increased IBT)	Scenario C (increased IBT and policy change)
Households with sufficient supply	89 %	96 %	99 %
Forest cover	123.000 ha	125.000 ha	130.000 ha
Share of HH budget for energy	17 %	15 %	15 %
Households - fuelwood - charcoal - LPG - others	 86 % 7 % 6 % 1 %	 86 % 7 % 6 % 1 %	 83 % 6 % 10 % 1 %

Besides the impacts, it is helpful to calculate the intervention costs of the different scenarios. The cost-benefit-ratio is a helpful indicator in the decision making process about the selection of intervention strategies.

In a **sensitivity analysis** the influence of variations in the base parameters are analysed.



Decision on key interventions
What has to be done?

The objective of the BEST development process is to establish a coordinated framework of short-term, medium-term, and long-term interventions for a sustainable management of biomass energy resources and providing better energy services to the people. This framework will combine energy and forestry activities (demand and supply). Of course, each country has its own specific needs which will shape its strategy, and the choice between options will be made by the actors involved in the strategy development process.

4.1 Select key interventions and define targets

Based on the broad vision of the BEST and the analysis of the current and future biomass energy situation, key interventions are developed and prioritised. The primary focal areas of a BEST are defined based on the projections in the intervention scenario and the strategic areas of action are identified. Then all the preliminary diagnostic work must be confirmed and approved through discussions at the national level. The estimated impact of the different intervention lines has to be evaluated, taking into account the costs of the interventions, the available resources, the time horizon (short-term, mid-term and long-term) and the capacity to implement the planned interventions. In addition, a risk analysis has to be carried out for each intervention line.

The following table shows a method to compare possible interventions qualitatively:

Possible intervention	Costs	Expected impact	Stakeholder involvement	Risks
Promotion of IBTs	medium	mid-term	high	low
Subsidy of LPG	high	short-term	low	high
Afforestation program	high	long-term	high	high
(…)				

Time is an important – and often forgotten factor to evaluate possible interventions!

It is important to analyse (desired or possible non-expected) side-effects of these interventions. In some cases, the risk of negative effects might be bigger than the targeted impact. One important factor is time – changing technologies or even fuel is a behavioural change which requires human decision taking – this takes time!

For each key intervention, quantified and time-bound targets should be established. A suitable time frame for achievement of the target is 10 years.[5] The achievement of these targets will be measured using indicators (see chapter 6: Monitoring and evaluation). Targets should be based on the long-term vision but can also aim at shorter periods, such as 2 or 4 years.

[5] Governments may wish to use 2015, the time frame for achieving the MDGs.

4.2 Stakeholder involvement

To ensure that the BEST is accepted by the most relevant actors, proposals should be presented to and discussed by the stakeholders identified during analysis (within core group and at public consultation workshops). The BEST should define the respective roles of the various actors. For assessing what different actors/groups can contribute to the implementation of the BEST, the following questions should be addressed:

- To achieve the targets in the prioritised areas – who needs to be involved?
- Who can contribute what kind of resources (financial, knowledge, structure etc.)?
- Who supports the strategy? Who is influential but not yet involved? How can these stakeholders be involved more strongly?
- What can be done to make participation effective?
- Who might resist the proposed changes and how might the resistance be overcome (e.g. vested interests in non-sustainable practices)?

The following table suggests possible levels of involvement of different stakeholders:

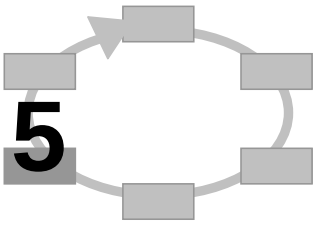
Stakeholder	Strategy formulation	Action planning	Implement activities	Monitoring	Adjustment
Government - national - local	 A C	 A B	 A A	 A B	 A C
Energy service providers	-	B	A	A	-
Consumers	C	C	B	-	-
Civil society	B	B	-	B	B
Financial institutions	C	B	B	C	C

A: High involvement

B: Medium involvement

C: Low involvement

Source: UN guidelines on Strategic Planning and Management of the Energy Sector (2002)



Planning action
Who does what and how?

Once the strategic areas and key interventions of the BEST are defined, **concrete actions** can be planned. For this it is necessary to translate the intervention lines into concrete activities (projects, programmes, legislative and regulatory measures etc.). These can be scheduled and undertaken according to their priority or urgency. A set of activities to be undertaken in a given period constitute the biomass energy action plan. The time frame for the action plan can for example be 2 years, noting that of course some of the actions will be implemented over a longer period of time.

5.1 Action plan with timeframe and responsibilities

The BEST and the related action plan form the frame of reference for organising and planning all ongoing and future activities concerning biomass energy. This framework should undergo technical validation and formal adoption by the national authorities concerned, and should be shared with the development partners. For each action, it has to be agreed who is responsible for its implementation, who will contribute, when it should be undertaken and with what resources. This can be visualised in a matrix (see below). The assignment of responsibilities for implementation should be done together with the relevant stakeholders, e.g. at a national workshop.

Objective / target	Actions	By when?	Who?	With which resources?
1. Stop depletion of forest stocks	1.1: Promote more efficient charcoal production practices			
	1.2: Start afforestation programme			
	1.3: …			
2. Access to improved/modern cooking energy by 50 % of the population	2.1: Promote local production and marketing of improved stoves			
	2.2: Subsidy programme for LPG			
	…….			

Without realistic deadlines and responsibilities planned actions will not be implemented.

The actions can be clustered according to e.g. fuel types, regional necessities or strategic areas of intervention.[6] This will depend on the problems and opportunities identified, as well as on the goals of the specific BEST. It is important to document the planned actions, setting realistic deadlines and attributing responsible persons or institutions as shown in the example below. In the planning, the necessary resources (financial, time, human resources) have to be defined. Once a rough schedule is defined, a calculation of costs can be made. Reasonable figures will also facilitate the task of securing long-term funding.

5.2 Key interventions and possible actions

Actions for achieving **efficient management of wood resources** and sustainable production of wood fuel:

- Develop a Woodfuel/Charcoal Supply Master Plan for the main cities.
- Transfer responsibilities for the management of forest resources to local communities.
- Develop (or update) and apply legislation and regulations.
- Implement afforestation activities (national programme or local initiatives).
- Set up an effective monitoring and control system for implementing the biomass energy action plan.

Actions to improve access to **energy-efficient and alternative fuels and technologies**:

- Expand the range of products offered to consumers (improved stoves/furnaces, gas or kerosene hot plates, etc.) in order to reduce consumption of wood fuel.
- Promote through capacity building, support to the private sector and social marketing, the dissemination of advanced and efficient technologies for SMEs (bakeries, breweries, smoking fish, etc., including also informal sector as far as possible).
- Promote wood conservation and substitution: establish sufficient fiscal measures, support the creation of commercial networks, implement marketing strategies, etc.
- Promote the use of improved low cost charcoal-making technologies for informal producers (e.g. improved pit kilns).
- Set up mechanisms to provide the majority of consumers (particularly women) in designated regions with access to products and services (micro credit or subsidies).

[6] Such as in the Draft Ugandan Biomass Energy Demand Strategy: main elements of the strategy were institutional aspects, human resource development, mobilising financial resources, dissemination and awareness raising, quality control, research and key actors & their role.

- Promote new and alternative fuels (briquettes made from agricultural residues, coal, ethanol gel, peat, biogas, biofuels and associated affordable cookers).
- Investigate barriers to expanding LPG market – e.g. distribution points, standard fittings, credit for cookers and bottles, introduction of smaller gas containers, finance for distribution companies, over-regulation, lack of standardisation etc.

Actions to **raise awareness** and improve communication:

- Undertake market research to identify key motivating factors that will provide incentives for take-up of improved technology (e.g. safety, image of modernity, cost, health etc.).
- Explain the aims and actions of the BEST in strong and simple terms, targeting the population affected, while demonstrating its relevance and its feasibility.
- Highlight how these aims and actions coincide with the motivations of stakeholders.
- Show that the BEST is credible and that it can mobilise the resources and methods needed to obtain results.
- Emphasise these results and how these results serve the BEST objectives.
- Inform locally about specific activities and the techniques and technologies to be disseminated.
- Establish an efficient control system on exploitation of resources, fiscal fraud, wood traffic to consumption centres, quality of production and labelling of stoves, biofuels, etc.

It might be helpful to set up **pilot programmes** in defined regions first to determine the acceptance and effects of certain interventions. This prevents a wrong allocation of large amounts of resources and generates the opportunity to adjust the programmes after a certain period of time. For example, the experience with the dissemination of alternative fuels and stoves can not simply be transferred from one country to another. The decisions of target groups on their use are influenced by many different factors.

5.3 Funding strategy

Long lists with possible actions are useless without making sure that funds are provided to implement them.

On the basis of the action plan, funding for the defined programmes and projects needs to be secured:

- Which budget is needed for implementing the planned activities?
- Where does it come from (national budget, private investment, donor contributions)?

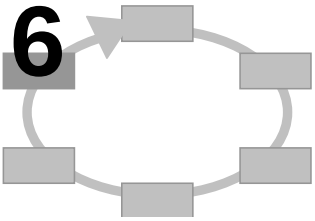
It is important to allocate at an early stage sufficient resources for biomass energy in the national and regional budget planning. With significant co-funding often additional funds can be mobilised!

To allocate resources and search for funding, some measures can be:

- Developing mechanisms to mobilise local capital
- Encouraging greater involvement of local banks in biomass energy investments
- Introducing smart subsidies for biomass energy initiatives, also as part of rural electrification (electrification together with IBTs) programmes[7]
- Developing appropriate financing packages for small and medium enterprises in biomass energy projects
- Promoting technology acquisition through hire purchase systems, e.g. for charcoal production technologies, institutional stoves, biogas, liquid petroleum systems

The development of modern biomass energy technologies requires substantial investment, which implies that supportive legal and regulatory frameworks and innovative financing methods are needed to attract investors and discourage unsustainable use.

[7] Note that for sustainability the scaling up of the use of the new technology should be on a commercial basis, but with some subsidies for programme costs such as training and technical support.



Monitoring and evaluation
How do we measure the success?

Without a systematic and constant monitoring and evaluation the management of the whole BEST process is impossible. It is also part of internal quality management, supports individual and institutional learning and serves the purpose of meeting accountability obligations to stakeholders and the general public. It will help to detect errors or new developments that require **adjustments of the BEST** and its implementation in a timely manner. Strategic management acknowledges continuous loops and may jump back and forth between the described steps. Both strategic thinking and acting are important and can occur at the same time.

Management structure and monitoring plan

Constant monitoring and evaluation provides necessary information to manage the BEST implementation.

Already during the development of the strategy, suitable steps must be taken to ensure its implementation. Once implementation starts there must be sufficient resources (funding) and an effective management structure to coordinate and monitor the different activities.

Regular meetings of the BEST team with a group of important stakeholders can serve as a platform to monitor the advances and discuss problems and opportunities which might occur during implementation. Such a “steering comitee” would meet for example every month and report to the leading Ministries.

At a certain “milestone” (e.g. one year after starting implementation), an evaluation is carried out by an external organisation. The evaluation establishes the degree to which a project or programme is achieving the set objectives. It will also ascertain the relevance, efficiency and results of a project or programme as well as reviewing its sustainability.

Suggested procedure:

- Establish success indicators for each target, already during strategy formulation. These indicators have to be precise and measurable and should include a defined source of verification.
- Monitoring action and impact: besides the monitoring of the advances in the planned actions there should indicators to monitor the impact (expected and unexpected) of the interventions.
- Define roles and responsibilities: Who is responsible for monitoring the implementation of the action plan and the achievement of the targets?
- Determine methods: How and when will this be monitored and reported?
- Adjustment: What has to be done if the targets are not achieved? What are the mechanisms to adjust the strategy in the event of important changes to internal and external factors?
- If necessary: correct strategic approach and key interventions.

Annex I: Definitions and important terms

Biomass is a very broad term which is used to describe material of recent biological origin that can be used as a source of energy among other uses. As such, it includes trees, crops, algae and other plants, as well as agricultural and forest residues. It also includes many materials that are commonly considered as wastes, including food and drink manufacturing effluents, sludges, manures, industrial (organic) by-products and the organic fraction of household waste. It excludes organic material which has been transformed by geological processes into substances such as coal or petroleum.

Biomass can further be divided into more specific subcategories, with different terms for different end uses (cooking, heating, power/electricity generation or transportation). The term **'bioenergy'** is often used for biomass energy systems that produce heat and/ or electricity from **solid biomass** and **'biofuels'** are frequently referred to as **liquid fuels** for transportation and heat and/or electricity generation. Bioenergy can also be used for cooling using absorption chillers that work on the same principle as your refrigerator.

Traditional biomass[8]

Traditional biomass is unprocessed biomass-based fuel, such as crop residues, fuel wood and animal dung, often used with very low efficiencies for cooking and heating in many developing countries. Although biomass is a renewable source of energy, the increasing demand and / or decreasing resources can lead to an insufficient energy supply and a further deforestation.[9] The traditional way of using biomass also causes health risks due to indoor air pollution and fire accidents.

Modern biomass energy

Modern biomass is the term often used for biomass produced on an industrial scale for electricity generation, industrial heat production and transportation (liquid fuels). It includes wood/forest residues from reforestation and/or sustainable management, energy crops, rural (animal and agricultural) and urban residues (including solid waste and liquid effluents), excluding the traditional uses of fuel wood in inefficient and polluting conversion systems.[10]

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[8] Stephen KAREKEZI, Waeni KITHYOMA, Samwel LEYIAN: Biomass Energy in Africa - Status, Trends and Options for Efficient Use. Background Paper for the BEST Workshop, September 2006

[9] http://www.regie-energie.qc.ca/audiences/3526-04/MemoiresParticip3526/Memoire_CCVK_07_TBP01-rationale.pdf, p. 7, The Case for Renewable Energies, Thematic Background Paper, José Goldemberg, Secretariat of the International Conference for Renewable Energies, Bonn 2004.

[10] http://www.regie-energie.qc.ca/audiences/3526-04/MemoiresParticip3526/Memoire_CCVK_07_TBP01-rationale.pdf, p. 7, The Case for Renewable Energies, Thematic Background Paper, José Goldemberg, Secretariat of the International Conference for Renewable Energies, Bonn 2004.

Woody biomass

Woody biomass is a term which describes different forms of biomass based on wood:

- Fuelwood, examples include: logs or any other form to be used in small stoves.
- Wood waste from wood-processing industry, examples include: bark, sawdust, shavings, offcuts, black liquor, etc.
- Forest residues, examples include: thinnings, prunings or any other leftover plant material after cutting
- Short rotation forestry, examples include: willow (Salix) or eucalyptus
- Woodlands/Urban biomass, examples include tree felling, both domestic and municipal, as well as the green and woody portion of municipal solid waste
- Processed wood/ charcoal

Improved biomass energy

Improved biomass technologies (IBTs) are those which offer a step improvement to traditional methods. They can contribute to more efficient and environmentally sound use or processing of biomass energy. Improved cookstoves and kilns, for instance, are designed to reduce heat loss, decrease indoor air pollution, increase combustion efficiency and attain a higher heat transfer. This results in savings in the amount of fuel used, which translates into direct cash or collection time savings.[11] Improved charcoal production methods can result in significantly reducing the burden on forests. If adapted to the needs of the poor households and informal enterprises, improved biomass technologies can be a first step towards a more sustainable provision of energy services based on available biomass resources and agricultural residues.[12]

Non-woody biomass

Biomass from agricultural crops: examples include various annual and perennial crops like Miscanthus, switchgrass, but also many traditional agricultural crops like maize, rapeseed, sunflowers, both for direct utilisation or liquid biofuels production.

Crop residues, examples include: rice or coconuts husks, maize cobs, cereal straw.

Processing residues, examples include: bagasse from sugar cane processing, olive marc from olive oil extraction, etc

[11] KAREKEZI and RANJA (1997); MASERA et al (2000) cited in: Stephen KAREKEZI, Kusum LATA, Suani TEIXEIRA COELHO (2004): Traditional Biomass Energy – Thematic Background Paper for Renewables 2004, Bonn, p. 15.

[12] Stephen KAREKEZI, Kusum LATA, Suani TEIXEIRA COELHO (2004): Traditional Biomass Energy – Thematic Background Paper for Renewables 2004, Bonn, p. 19.

Other organic waste

Animal waste: includes manure from pigs, chickens and cattle (in feed lots) if these animals are reared in confined areas

Sewage sludge: domestic and municipal sewage from mainly human waste

Biogas

Biogas typically refers to a (biofuel) gas produced by the anaerobic digestion or fermentation of organic matter including manure, sewage sludge, municipal solid waste, biodegradable waste or any other biodegradable feedstock, under anaerobic conditions. Biogas is comprised primarily of methane and carbon dioxide. Synonyms include:

- swamp gas
- mash gas
- landfill gas
- digester gas

Biogas can be used for direct thermal use or for generating electricity. For reasons of the complexity of production technology, biogas for electricity production will not be covered further by the BEST Guide.

Liquid biofuels

Biofuels include bioethanol, biobutanol and biodiesel. Biodiesel and biobutanol are direct biofuels and can be used directly in petroleum engines. The potential for efficient biofuels usage in stoves is currently under assessment.

Annex II: Stakeholder involvement in the BEST process

BEST development process	Key Elements	Stakeholder Involvement
1. Clarifying mandate and vision	Clarify the mandate for developing a biomass energy strategy Formulate the vision based on biomass energy policy - to be consistent with your strategy Clarify the roles of different stakeholders and form a BEST team to coordinate the process Define scope, time horizon and resources needed and available	A vision and a socially justifiable mission can inspire stakeholders
2. Analysis of the initial situation	Identify the baseline and collect relevant data systematically Identify driving forces and trends that affect the issue. These include demographic, technological, socio-political and economic developments. Assess past and current initiatives (especially outputs, not only activities and inputs)	Stakeholders help in collecting and supplying data (necessary: same method of assessment) Stakeholder workshop to identify driving forces
3. Development of scenarios	Develop plausible descriptions of the future situation. Capture a pattern of activities in a trend that is: better, worse, staying the same or technically possible, most sustainable, business as usual The scenarios have to be internally logical and consistent Use very narrative and visual descriptions	The more stakeholder involved the more plausible the picture becomes Ideally to be done in an inter-disciplinary team
4. Decision on key interventions	A strategic issues map on a two-dimensional scatter-gram using importance and control as your axes helps you to prioritise Identifying and prioritising strategic issues Describe the consequences if issues are not addressed. This helps to check how strategic your issue is	The strategic issue map should first be done internally At a later stage again with key stakeholders. Or key stakeholders are given the strategic issue map to “read” and to give their interpretation

5. Action planning	Address the identified strategic issues through setting visionary goals (In 10 years we want to be…) and specific targets in shorter time span Make necessary legal and institutional arrangements, you might have to remove barriers first Develop action plan with objectives / targets, activities, responsibilities, time line, resources Develop funding strategy based on the resources needed	Assigning targets and agreeing on action plan with those stakeholders involved in implementation.
6. Monitoring and evaluation	M&E begins already during the stage of agreeing on the action plan Importance, indicators, methods and schedule of verification are agreed upon Evaluation of results Report and follow-up Feedback of M&E results can lead to adjustments and remedial actions or to a completely new cycle of a BEST process	Division of labour: parts of the monitoring can also be undertaken by stakeholders or external organisations (e.g. research institutions) Feedback and report to all stakeholders and public

Annex III: Important institutions to be considered in the development of the BEST

Government	Private sector	Civil society
National Ministries of • Energy • Forestry • Agriculture • Environment • Transport • Health • Education • Rural development • SME promotion • Commerce • Finance/ Planning Provincial governments Municipalities Representatives of local communities	Farmers (small/ large scale) Landowners Fuelwood collectors Charcoal producers Fuelwood/charcoal transporters Fuelwood/charcoal traders Stove producers LPG/kerosene distributors Private operators, energy companies/ producers Timber industry Financial institutions, e.g. microcredit banks	Traditional authorities Farmers organisations Women groups Research institutions Church organisations Non-governmental Organisations (NGO) for rural development, environment etc.

Annex IV: Analysis of biomass energy technologies

The following parameters are useful to analyse biomass energy technologies:

- Availability/ accessibility of the technology
  - o Range of technologies (and respective fuels)
  - o Accessibility on the local market
- Dissemination (absolute/ relative)
  - o Shares of technology within the whole market (its result reflects the share of consumption purposes)
  - o Distribution channels
- Usability (which is a selection factor)
  - o Is the technology appropriate? (especially for local cooking habits)
  - o Is the technology convenient? (Does the future user need additional training or is the technology easy to use?)
  - o Is the technology modern? (image factor)
- Efficiency
  - o Fuel consumption of each technology
  - o Mode of consumption
  - o Savings (fuel savings, cost savings)
- Clean combustion (aspects of emissions/ indoor-air-pollution)
- Costs
  - o For households and SMEs (affordability)
  - o Production costs (and: what is the benefit for the producer?)
  - o Availability and costs of primary materials
  - o Influence of subsidies (comparison of prices with and without subsidies)
- Potential for local production
- Assessment of local skills and training needs

The following matrix is an example how to document and process the collected data, comparing the different user technologies:

Sector of application	Overall share	Fuels/ Tech-nologies	Dissemination			Efficiency	…
			share	user groups	distribution channels	savings (fuel/ costs)	…
HH stoves	xy % (or absolute)	fuelwood	xy	e.g. rural (poor), urban (poor), …	e.g. direct marketing, resellers, …	…	…
		charcoal	xy	…	…		
		…	…				
Xy Application	xy % (or absolute)	…	…				

Annex V: Conditions for successful implementation of a BEST

Institutional and political aspects

The act of formulating the BEST should reveal the links between it and the primary reference frameworks, whether international (for example Agenda 21, CCD, UNFCCC, CBD…), regional (e.g. the ECOWAS white paper, SADEC, CILSS), or national (PAN/LCD, biodiversity strategy, poverty reduction). This gives the biomass energy sub-sector its due place in development policies.

Incorporating the role of women

The importance of the role of women should be highlighted, e.g. in the production, sale, and consumption of biomass energy in certain countries in both rural and urban areas. The BEST should formulate specific recommendations for concrete actions, ensuring:

- the involvement of women in the decision-making process,
- their access to the financial resources created by the BEST,
- the organisation of educational sessions specifically for them.

Communication, information, and public awareness

The success of a BEST is closely linked to how strictly all categories of actors adhere to it. This compliance does not simply happen. It must be encouraged, maintained, and supported. This is obtained by developing and implementing a true communication policy with solid supporting arguments, differing approaches for each target group, and the use of appropriate vectors.

Two types of communication must occur: global communication for the entire sector and local communication about specific activities and the techniques and technologies to be disseminated (refer to the household energy communication strategy for further details).

Capacity building

Capacity building is essential to the implementation of the BEST. It provides a better understanding of the objectives and content of the BEST and the respective roles of each actor. It should be an ongoing activity from the beginning. To achieve this, the educational needs of the different actors (decision-makers, technicians, craftspeople, local communities) must be identified and translated into modules and programmes to be taught in national and sub-regional institutions. The schools as educational institutions for future users and awareness creators at home should also be considered.

Knowledge of the market

The BEST must make sense both commercially and economically. Potential markets for household energy technologies and alternative fuels

must be well defined, so that appropriate commercial steps can be taken. The BEST must also be able to create and maintain new markets, monitoring and anticipating consumer desires concerning technologies and fuels.

Research and development

The BEST is a dynamic undertaking. During its execution it must be able to integrate new methods and techniques or disseminate/promote new technologies/fuels. It is therefore important to have measures for accommodating new requirements. This will be achieved by creating an appropriate research and development mechanism by involving local/national research and training institutions in areas where less data or information is available.

Assumptions contributing to the success of the BEST

When developing a BEST, realistic assumptions to ensure the complete success of its actions must be made, understood, and accepted by all actors. These assumptions will of course vary with specific national requirements, but they will essentially concern:

- an institutional, legislative, and regulatory framework creating the conditions necessary for the actors to commit themselves (decision makers, technicians, civil society organisations, populations)
- partnership with local governments, based on a realistic evaluation of their ability to relay activities to the target populations (e.g. the enforcement of regulations; licensing of charcoal makers and wood cutters)
- a climate of trust established with private investors, encouraged by establishing clear and strict rules from the very beginning concerning authorisations and subsidies, and by demonstrating extreme flexibility in administrative procedures.

Risks and flexibility

As is true with any human undertaking, the BEST may encounter problems during its execution. The risks it may encounter must be clearly defined during its development. These risks are found during the diagnosis.

As an example, one major risk is certain to be the questioning by the BEST supervisory authorities of proposed administrative and organisational choices concerning its implementation or concerning revisions to taxation and regulations. In fact, the proposed choices will essentially move towards greater autonomy from administrative departments, and therefore will eliminate some of these departments' prerogatives. This risk is particularly sensitive in the management of forest resources, where private operators have not traditionally been involved.

Decentralisation may also be a risk. Local governments have an essential role to play in implementing the BEST, particularly in the management of forest resources. A deficiency in this role could create a situation of confusion, which would be a step backwards.

Annex VI: Costs and characteristics of alternative fuels[13]

	Capital cost*	Fuel cost	Notes
Biogas	$100 – 1 000	0	Commercially available; direct fuel cost is zero (requires water and dung or leafy biomass material, usually collected in non-commercial form); more economic at village scale; an important option for some rural areas, in China and other parts of Asia; less favoured in Africa, where villages are more dispersed; formed by anaerobic digestion.
Plant oils	$38-45	$0.45-$0.60 per litre	Deployment phase; functions like a kerosene pressure stove; safer than kerosene or LPG; burns oils such as coconut, pal, rapeseed, cotton seed, castor and jatropha; renewable resource which can be locally produced.
DME	$45-60	$0.25-$0.35 per kg	Demonstration phase; similar to LPG; dimethyl ether (DME) is today manufactured in small-scale facilities by dehydration of methanol derived from natural gas or coal. DME can also be produced from biomass. The construction of large plants for making methanol and DME from coal has recently been announced in China, where most production is used for blending with LPG.
Ethanol gel	$2-20	$0.30-$0.70 per litre	Deployment phase; viable particularly in areas with large sugar cane plantations that produce ethanol; safe and clean biomass cooking fuel, being promoted in several African and south Asian countries.
Kerosene	$5-40	$0.50-$0.60 per litre	Commercially available; produces more emissions than LPG and carries a higher risk of injury; available as a liquid or gas; in liquid form, easier to transport and distribute and can be purchased in any quantity.
LPG	$45-60	$0.55-$0.70 per kg	Commercially available, more widely in urban areas than rural; issues of affordability and distribution limit use in rural areas; disadvantages of LPG for low-income households are its relatively large start-up cost and refill cost.

* Cost of digester for biogas; cost of stove and cylinder for all other fuels.

[13] OECD/ IEA (2006): World Energy Outlook 2006, Paris, Table 15.3, p. 434.

Annex VII: Important documents

Comité Permanent Inter-Etats de Lutte Contre la Sécheresse dans le Sahel (CILSS): Guide d'élaboration de stratégies nationales d'énergies domestiques, 2002

GTZ/Programme for Biomass Energy Conservation (ProBEC): Policy and Strategic Management Toolkit, 2004

Stephen KAREKEZI, Kusum LATA, Suani TEIXEIRA COELHO (2004): Traditional Biomass Energy – Thematic Background Paper for Renewables 2004, Bonn

Stephen KAREKEZI, Waeni KITHYOMA, Samwel LEYIAN: Biomass Energy in Africa - Status, Trends and Options for Efficient Use. Background Paper for the BEST Workshop, September 2006

OECD/ IEA (2006): World Energy Outlook 2006, Paris

Olga Svoboda, MEETI (2004) and Bryson, J.: Strategic Planning for Public and Non-profit Organisations, 1988

Regional Multisectoral Committee (RMC): Devising a National Strategy for increased Access to Energy Services for rural and peri-urban Populations, 2nd Meeting of the RMC, Dakar 2006

UNEP Collaborating Centre on Energy and Environment, Plan for Development of Uganda's Biomass Energy Strategy, November 2001

UN Economic and Social Commission for Asia and the Pacific (2002): Guidelines for Strategic Planning and Management of the Energy Sector

ITDG - Biomass Technical Brief :
http://www.itdg.org/docs/technical_information_service/biomass.pdf

IEA bioenergy: http://www.aboutbioenergy.info/definition.html

José GOLDEMBERG, Secretariat of the International Conference for Renewable Energies: The Case for Renewable Energies. Thematic Background Paper, Bonn 2004:
http://www.regie-energie.qc.ca/audiences/3526-04/MemoiresParticip3526/Memoire_CCVK_07_TBP01-rationale.pdf