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BIOMASS ENERGY STRATEGY (BEST) GUIDE FOR POLICY-MAKERS AND ENERGY PLANNERS

The Biomass Energy Strategy (BEST) initiative is a joint effort of the EUEI Partnership Dialogue Facility together with GTZ's 'Poverty-Oriented Basic Energy Services (HERA)' programme, implemented on behalf of the German Federal Ministry for Economic Cooperation and Development.

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The Biomass Energy Strategy (BEST) Guide is available online on www.euei-pdf.org/publications.html

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PART A: THE BEST INITIATIVE



Deforestation to obtain arable land, Malawi

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Tree seedlings for reforestation, Madagascar

© GTZ/Martin Egbert



Traditional cooking creates an unhealthy living environment

© GTZ



Cleaner stoves reduce indoor air pollution, Kenya

© GTZ Kenya

WHAT DOES “BEST” AIM TO ACHIEVE?

PART A: THE BEST INITIATIVE

The Biomass Energy Strategy (BEST) initiative aims to build awareness of biomass as **Africa’s main source of primary energy** and to highlight its relevance **to poverty alleviation efforts**, especially among decision-makers at policy level. The focus in this guide is on **thermal applications** of biomass energy in households, institutions and small and medium enterprises, that is, what is considered the traditional biomass sector.

In practical terms, the BEST initiative supports African governments to develop national biomass energy strategies that set out rational and implementable approaches to manage the biomass energy sector. These strategies are country specific but typically outline a combination of measures designed to improve the sustainability of supply, raise end-user efficiencies and promote alternative sources of energy where appropriate. While the focus here is on thermal applications, a similar process of strategy development can address supply and demand for electricity generation and biofuels as well.

The Strategy process aims to enlist a variety of stakeholders in developing a consensus around a biomass energy strategy, in a participatory manner: government, the private sector and civil society, including women’s organizations and groups, given women’s key roles in the biomass supply and demand system.

At the same time, the initiative aims to **address negative perceptions of biomass** energy and to

provide alternative perspectives and solutions. For example, biomass fuels are frequently associated with two major issues facing African countries: deforestation and indoor air pollution.

In fact, deforestation (defined as a permanent change in land cover from trees to some other land use) is the result of a range of factors which may include population growth, low agricultural productivity and land policies. Biomass energy is often a by-product of land clearing for some other purpose. Therefore eliminating the use of biomass is unlikely to lead to any significant reduction in deforestation rates. Deforestation is a problem that demands a diverse array of solutions, which are beyond biomass energy issues.

Indoor air pollution, also, is not an automatic and unavoidable result of using biomass fuels. Biomass can also be burned efficiently and cleanly in modern appliances, and this may be a more cost-effective solution to the problem than aiming to eliminate the use of biomass altogether in favour of imported, more expensive or less familiar fuels.

The BEST process can tackle such misconceptions by showing that neither deforestation nor poor health are a sole or necessary result of the use of biomass energy, and that new solutions can be developed to manage both challenges.



Woman carrying firewood, Uganda

© GTZ Uganda



Selling charcoal at the roadside, Malawi

© GTZ Malawi

1. WHY ARE BIOMASS ENERGY STRATEGIES NEEDED?

Biomass is a broad term describing biological material derived from living or recently living organisms. It includes trees, crops, algae, and other plants, as well as agricultural and forest residues (see Annex A for a full description). The most widespread forms of biomass energy in Africa are firewood and charcoal, together known as woodfuels.

Biomass is the **main source of energy in sub-Saharan Africa**. In some countries it accounts for more than 90% of primary energy consumption. It is well known that collecting biomass fuels to provide cooking energy for rural families is an unpaid burden on women's and children's labour. But the commercial biomass energy sector also employs hundreds of thousands of people and contributes millions of dollars to local economies in the form of revenues, taxes and individual incomes from harvesting, transport and trade. Woodfuel sales generate significant flows of income from urban to rural areas. With petroleum products such as kerosene and liquefied petroleum gas (LPG) unlikely to become significantly cheaper over the coming decades, **demand for biomass** – both commercial and non-commercial - is **expected to continue growing**. The intra-biomass transition from firewood to charcoal, a typical result of growing urbanisation, is further contributing to a rise in total biomass consumption that is outpacing population growth, because towns are growing faster than rural areas.

Yet biomass fuels are often seen as “traditional”, even backward, and seldom receive high priority in government planning for energy management and poverty alleviation. In spite of their prominent role in people's lives, these fuels are typically not addressed in national energy strategies (or are given low priority compared with electricity and petroleum products). They also face the above-mentioned stigma of causing deforestation and ill health.

Some countries have implemented isolated projects to demonstrate more pro-active approaches to biomass, and some are giving biomass new attention as they seek to reduce dependence on imported fuels or to address climate change concerns. But government commitments to work more actively with biomass are rarely implemented. In many countries charcoal – the leading commercial biomass fuel – is even banned, rendering one of Africa's most important sources of energy effectively illegal.

The sidelining of biomass energy has delayed serious debate about how to manage this vital socio-economic sector. At the same time, biomass energy

consumption has reached a stage in many countries where it can no longer be sustainably sourced from state-owned land (such as forest reserves). **New strategies are urgently required** to manage and incentivise production from privately owned sources.

The keys to addressing this situation are to persuade governments and other stakeholders to **give biomass higher political priority**, and to **develop effective and practicable ways to manage and support the sector**. Efforts to encourage better management have often been characterised by inadequate planning data, poorly informed opinions about biomass energy and an absence of success stories on which to build. The development of biomass energy strategies, as supported by the BEST initiative, aims to overcome such challenges.

1. WHY ARE BIOMASS ENERGY STRATEGIES NEEDED? (continued)

BEST development can lead to the following positive outcomes:

- The formulation of an official strategy on biomass energy expresses a **government's acknowledgement** of its contribution to **improving energy access** alongside "modern" energy sources such as LPG and kerosene and (to a minor extent) electricity. This can allow governments to allocate budget and finance correspondingly and address the issue in a more prominent and proactive manner.
- A strategy development process can focus public attention and promote consensus on an issue that directly affects most people, both women and men in different ways, creating **wider awareness** and a **greater acceptance** of the need for intervention.
- Strategy development can ensure that **long-term planning** takes place, particularly on the supply side (e.g. reforestation), where results can be expected only after several years. Crisis management in the absence of a strategy helps only to resolve short-term bottlenecks, not structural problems.
- Biomass energy is a **cross-cutting issue**. Only co-ordinated and strategic action involving different sectors (e.g. energy, forestry, rural development, land, agriculture, natural resources and health) will guarantee that policy interventions are accepted.
- The introduction of new approaches, whether technologies, fuels or methodologies, requires a **supportive policy framework** to reduce incremental costs and promote sustainable options to the point where they can be disseminated by market mechanisms.



Trees and arable land, Ethiopia

© GTZ/Verena Brinkman

2. WHAT BARRIERS DOES THE BEST INITIATIVE FACE?

The evaluation of past experiences with biomass energy initiatives in some African countries have led to the following findings:

Perception: Policy-makers are often preoccupied with electricity and liquid fuels; biomass energy is associated with underdevelopment and environmental degradation, and is given low priority.

Financial: Biomass fuels tend to be relatively cheap per unit of energy, and production and supply is generally managed within the informal sector. Together with long gestation periods and small profit margins, this usually makes investment in biomass energy unattractive to large capital.

Legal: In many countries, biomass fuels may only be harvested and transported under licence, and these licences are often not issued. Large sections of the industry thus operate outside the law, making it difficult to engage effectively with those in the supply chain.

Information: Facts and figures concerning the central role of biomass energy are often inaccurate or undocumented. The home-grown nature of biomass and the complexity (and sometimes illegality) of production and marketing networks makes supply and demand much more difficult to measure than for fossil fuels or electricity. Institutions responsible for biomass energy data-gathering often lack financial and human resources and play a marginal role in government policy-making.

Technological: The *de facto* illegality of some biomass fuels, the informal nature of production and consumption, and a general lack of access to information means that uptake of modern systems of production and consumption (e.g. charcoal kilns) tends to be low.

Institutional: The low status accorded to biomass energy is often reflected in a shortage of well-qualified personnel to support the sector. There tend to be few experts in the area of biomass energy, and they are typically sidelined in underfunded institutions with limited potential to influence others.



Traditional cooking, Malawi

© GTZ/Lisa Feldmann



Illegal charcoal burning the edge of a natural forest, Madagascar

© GTZ/Martin Egbert

The BEST initiative tackles these barriers by supporting national strategy development processes through four key stages:

- Technical assistance from national facilitators and international consultants to work with governments to identify key challenges in each country and provide tools for developing scenarios
- Support for teambuilding and for designing national stakeholder dialogues
- Technical assistance to design national biomass energy strategies
- Regional workshops to exchange experiences between participating countries

While there will be similarities between countries, the BEST philosophy is to assist with country specific strategies that engage all relevant sectors and stakeholders. The box below explains how a strategy relates to a policy.

Strategy vs. Policy

A strategy describes the key interventions required to achieve policy aims. While policies address challenges and set goals for change, strategies analyse the different ways to reach the goal, propose appropriate intervention lines and set out concrete actions by which the goals will be achieved. A strategy is a set of concepts to facilitate decisions and take actions to implement a policy. In practical terms, it is obviously much better if a national energy policy is in place before BEST gets underway.

There may be no energy policy in place, or such a policy may exist but with inadequate or inappropriate reference to biomass energy.

Previous strategy development processes have shown that **full political commitment and ownership of the BEST process at country level is crucial**. The technical elements of analysing the sector status and proposing future interventions may prove relatively simple, given the right expertise, but it may be more challenging to secure high-level commitment from national governments that a biomass strategy is actually required, will make a useful contribution, and will be supported and implemented. Biomass is a sensitive political issue that affects most people and has major economic and environmental impacts. Technical evidence alone is not sufficient to produce optimal policies and strategies; the other factors must also be understood.

Key requirements within government, prior to initiation of the strategy development process, therefore include:

- Demonstrated commitment and ownership of decision-makers at political level
- Involvement and commitment of relevant sector ministries
- Capacity-building at technical level within the ministries
- Sufficient time to involve relevant stakeholders at national and regional levels, and to communicate the strategy's objectives and contents



Burnt down areas, Madagascar

© GTZ/Marlies Kees

4. WHAT IS THE OBJECTIVE OF THIS GUIDE?

This guide aims to show policy-makers and energy planners how to develop a national Biomass Energy Strategy.

Ideally, the BEST development process should result in a **coordinated framework** of short, medium and long-term interventions to achieve sustainable management of biomass energy resources and provide better energy services to the people. This framework will combine both **demand-and supply-related activities**. Each country has its own specific needs that will shape its strategy, and the actors involved in the strategy development process should choose between the options.

The scope of the BEST Guide is the **thermal application** of biomass energy for households, institutions and small and medium enterprises (SMEs). However, other areas of biomass energy use should be included in the strategy if they are relevant for a particular country. An integrated approach to resources is important – for example forestry policy needs to take account of all the needs for tree crops and wood products, on top of their energy potential.

Despite certain similarities between African countries, there are of course differences, particularly in the availability of biomass resources. This guide is therefore a general framework that provides direction to develop a BEST, and which should be **adapted to reflect country-specific priorities and needs**.

Consultation and discussion with stakeholders at each stage of the process is vital, and at times it will be necessary to review the approach and make adjustments.

5. LESSONS LEARNED FROM THE FIRST PHASE OF BEST (2006–2009)

The first edition of the BEST guide was published in 2007, and BEST-supported consultants subsequently worked with national governments in the development of biomass energy strategies in Botswana, Lesotho, Malawi and Rwanda. On the basis of both the lessons learned during these processes and deliberations at two regional workshops held in Johannesburg (June 2008) and Kigali (April 2009), this revised guide was produced in late 2009. It should allow the lessons learned in the first round of BEST to be disseminated and applied as the process is expanded to additional countries.

Experiences from the first four BEST studies suggested that the original strategy development approach required some adjustment. In several of these studies the early findings of the BEST teams started to lead them to conclusions that were not consistent with existing policies, and this made it difficult for them to continue working on a strategy document that would be accepted and adopted without amendments to those policies. Typically, projections of future energy demand by BEST teams would foresee significant growth in biomass energy consumption, whereas national policies prescribed the phasing out of biomass.

It was therefore agreed that subsequent **BEST country processes should be phased and more open-ended**. It is now suggested that the phases are addressed one at a time, with progression contingent on the achievement of **milestones** pegged to participation and endorsement from stakeholders – in particular from the national government.

PART B: DEVELOPING A BIOMASS ENERGY STRATEGY



Cleaner Cooking, Uganda

© GTZ/Verena Brinkmann



Stove production

© GTZ



Gasstove Addis Ababa, Ethiopia

© GTZ/Christa Roth



Seedlings, Ethiopia

© GTZ

Ideally BEST development will follow a six-stage systematic approach that can be summarised as follows:

1 Stakeholder analysis and team formation	What are the BEST vision and objectives? What is the political and policy environment? What are the roles and responsibilities of sector stakeholders? Who is in the BEST team and how will they work?
2 Baseline sector analysis	What is the current energy supply and demand situation? What are the trends and their implications? What is the BEST scope, time horizon and process?
3 Development of scenarios	How is the energy situation likely to develop? What happens under different assumptions?
4 BEST strategy development	What are the options for intervention? Which of them should be implemented?
5 Action planning	What are the priority actions? Who will implement them? With what resources? Over what timeframe?
6 Adoption and implementation	Endorsement Launch Implementation

Each step is crucial for the success of the process:

- if the stakeholder analysis is incomplete then influential actors may be inadvertently left out;
- if the sector context has not been analysed carefully, activities might be developed that go against prevailing policy;
- without proper prediction of future outcomes, it is difficult to define realistic targets;
- without the involvement of all stakeholders in agreeing key interventions, the strategy will not be endorsed;
- without detailed planning of actions and attribution of sufficient resources, the strategy will never be implemented.

The **process** of developing a BEST is 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 to collect their responses and observations. The process is divided into stages which should be implemented one at a time, ensuring full stakeholder buy-in before proceeding.

The first stages in developing the Biomass Energy Strategy are to agree upon the vision; identify the sector stakeholders, their mandates and potential contributions to the BEST process; determine the political and policy environment; and set up an appropriate institutional structure for the development of the Strategy.

Step 1: Clarify vision and objectives of the Biomass Energy Strategy

A strategy sets out the way towards a **final destination**. The destination has to be very clear. Setting broad, long-term objectives provides a reference for strategy formulation and helps to focus on the main areas of intervention at a later stage.

BEST development will typically involve consultants working with government staff in a core team or steering committee (see Step 4). It is essential that all parties agree at this stage on the vision and objectives of the strategy. While the consultants may be ready to move quickly with predicting the future situation and designing an intervention package, government institutions work in a slower moving context where decisions require wide-ranging consultation.

The vision describes the desired situation in the long term (15 to 30 years). It should both include a qualitative statement that covers all the sectors involved and address economic, social and environmental impacts. The vision should ideally build on existing frameworks such as the national poverty reduction strategy and national energy policy.

Example:

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

Biomass energy and MDGs

The Millennium Project, which emphasises that access to energy is essential for achieving all of the MDGs, calls on countries to “reduce the number of people without effective access to modern cooking fuels by 50%, and make improved cooking stoves widely available” by 2015.

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

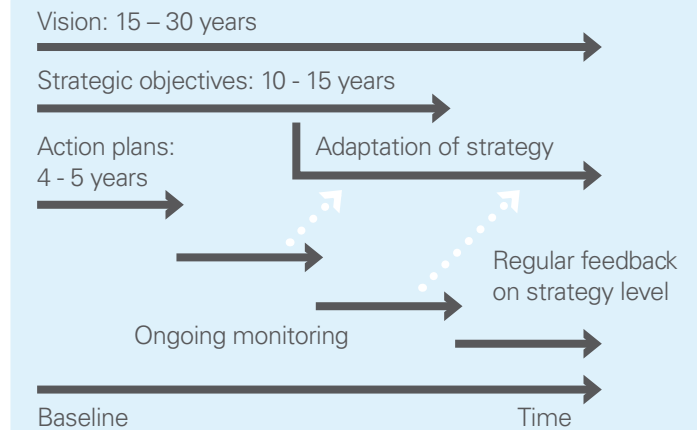


Charcoal at the roadside

© GTZ/Christoph Messinger

Example:

By 2015, 80% of the rural population will use improved biomass energy technologies or LPG for cooking.



Helpful questions are:

- What should energy supply look like in the future?
- What is the ideal energy supply system for the country?
- How should biomass energy be used?
- Which improvements are desirable?
- What should the biomass energy market look like in the future?
- In the long run, is it preferable to stabilise the current situation and make it more sustainable, or would it be better to shift to other energy resources?
- What major changes should be promoted?

Step 2: Assess political and policy environment

Prevailing policy, institutional, legal and regulatory conditions need to be understood. This will help ensure that the BEST is compatible with the wider legal and policy environment. Relevant documents to consult may include poverty reduction strategies, national energy policies, source-specific energy policies (e.g. national electricity policy) and forestry policies.

Ideally, these documents will support the development of the biomass energy sector and provide a useful foundation for the BEST. However, it is also possible that biomass energy may not be supported by existing policies or that such policies will recommend the phasing out of biomass. In this case the direction of the strategy may be affected. It may then need to consider whether such wider policies are realistic and implementable, and this will take the BEST process to a higher political level.

In conducting the institutional and regulatory assessment, the following areas should be analysed:

- **Policy framework:** Which policies impinge on energy? What do they say about biomass energy? Are they consistent? effective? implemented?
- **Institutional responsibilities:** Which ministries and departments are responsible for which aspects of biomass energy? What are their mandates, resources and capacities? (This will be expanded in the stakeholder analysis that follows).
- **Regulatory structures:** What laws and regulations relate to the production and use of biomass energy? What licences are required to produce or supply biomass? How effective is their enforcement?
- **Financial aspects:** What official revenues are expected from biomass energy? Are these revenues collected? Are there any subsidies? Are there any donors or lending agencies supporting the energy sector, and specifically the biomass sub-sector?
- **International aspects:** What bilateral or regional agreements or regulations exist concerning the management of energy, including biomass energy?

Step 3: Conduct stakeholder analysis

Identifying and involving relevant stakeholders in the BEST process is a precondition for its success. Only with the participation of the leading organisations and individuals working on energy issues can a realistic understanding of the problems and opportunities in the field be achieved. Their early involvement will also help create awareness and ownership of the BEST process, maximising the chances of their later support in the design and implementation of proposed interventions.

Definition of “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.

STAGE 1: STAKEHOLDER ANALYSIS AND TEAM FORMATION (continued)

A diverse set of actors have a stake in the biomass energy sector and are likely to include, amongst others:

Government	Private sector	Civil society
Ministries of: <ul style="list-style-type: none"> • Energy • Forestry • Agriculture • Environment • Transport • Health • Education • Rural development • SME promotion • Commerce • Women’s Affairs • Finance/ Planning • Universities and technical institutes 	<ul style="list-style-type: none"> • Forestry companies • Energy companies • Agribusinesses (tea, tobacco, etc.) • Woodfuel producers, transporters and traders • Stove producers • Petroleum distributors • Private energy companies (biofuels, power generation, etc.) • Timber industry • Financial institutions, e.g. microcredit banks • Farmers – large and small (e.g. through focus groups) 	<ul style="list-style-type: none"> • International and local NGOs including women’s organizations and groups • Donors and lending agencies • UN bodies • Research institutions • Consumers (private households, requiring gender-disaggregated efforts to establish preferences for different cooking methods and combinations of fuels, etc.)

The key roles played by women in the biomass energy sector should be identified and recognised, and efforts made to ensure that representatives of women’s perspectives are acknowledged and involved in the BEST process.

Each stakeholder or group needs to be consulted to establish:

- mandates and roles in relation to biomass energy;
- resources, expertise and capacities at their disposal (this preliminary assessment of capacity can be followed up with a more detailed assessment once it is clear which exact measures need to be undertaken within the BEST – see Step 10);

- experiences and main lessons learned (for example in stoves and kilns, promotion of alternative fuels, energy conservation, agro-forestry or rural electrification);
- current programmes and future intentions; and
- potential linkages to the new biomass energy strategy.

Stakeholders may have conflicting interests. Some will support more direct engagement and formal planning for the biomass energy sector, others might be against it. An understanding of organisations and actors in the biomass energy sector, their interests, views and potential contributions is necessary during the analytical stage of the BEST. With a simple tool, the most critical group of stakeholders can be identified: those who are influential but opposing (see diagram below). These groups in particular have to be addressed and involved in the process.

	Influential	Less influential
Supportive		
Opposing	Critical	

Step 4: Assemble the BEST team

Designing a sound and implementable biomass energy strategy requires a **transparent organisational framework** that represents relevant stakeholders. Based on the findings of the stakeholder analysis, a core team should normally be formed comprising a coordinator and a small number of key decision-makers (e.g. from the Ministries of Energy, Forestry and Trade and Industry) who are mandated by the government to guide the process.

The BEST needs a **clear statement of political will and strong backing** from the ministries involved. This should be reflected in their active and leading role. In particular, it must be clear from the beginning who is driving the process. Given the cross-cutting nature of biomass energy and the political authority that may be called upon to address the issue seriously, it is advisable for coordination to take place above the level of individual line ministries – for example in the Prime Minister’s office or similar. Hence there may be an overall BEST Coordinator at supra-ministerial level, supervising a Core Team of four or five permanent secretaries or departmental heads.

If a committee already exists in which stakeholders in the energy and environment sectors meet on a regular basis, then it would be preferable to use this forum as the core team for the BEST process, rather than creating a new structure.

In the initial BEST countries, a core team of government officials and consultants was supported by a larger steering committee or working group comprising 20–25 stakeholders from NGOs, private sector institutions and donor agencies. This model was not always effective, however, because some members had only peripheral knowledge or interest in the process and tended to delegate junior staff to attend meetings. It may instead be advisable to focus on establishing a **small but well-placed core team** working directly with a team of consultants. A wider stakeholder group may then be consulted at key points in the process (perhaps through national workshops).



Private stove producer, Malawi

© GTZ/Andreas Michel

Possible BEST coordinating structure



The BEST coordinating structure should be well defined with clear lines of reporting and communication. The roles and responsibilities of all those involved should be agreed upon.

They may include the following:

Core team:

- Make executive decisions
- Coordinate Steering Committee
- Liaise with consultants
- Set targets and monitor progress

- Report to donor(s) (if any)
- Resolve conflicts
- Provide technical and strategic input
- Provide quality control
- Carry out implementing role(s) (possibly)

Consultants:

- Gather and analyse data
- Produce baseline projections and interpretation
- Develop scenario
- Provide international perspectives and experiences
- Develop intervention options and action plan

Stakeholder group:

- Be sounding board for findings, analysis and proposals
- Share experiences and knowledge
- Carry out implementing role(s) (possibly)

This structure is just one option. Other arrangements may be equally effective for managing the BEST development process in particular countries.

Decision points:

Evaluate whether existing policies support the BEST objectives and whether the main stakeholders are providing sufficient support.

Before continuing with the sector analysis that underpins the development of the BEST, the **validity of the vision and objectives** need to be confirmed, taking into account the findings of the policy and stakeholder assessment. If the assessment has suggested that the vision or objectives need to be modified, then this is the time to do it.

Moreover, the stakeholder analysis should say if there are any *influential but opposing* actors. If they exist, then they may present a major obstacle to the continuation of the process as per the agreed vision. Past BEST experience suggests that technocrats from the forestry sector tend to be supportive of a vision which foresees consumptive use of biomass resources, as they have been trained to embrace the sustainable exploitation of trees, whereas it is more common for energy specialists, environmentalists and politicians to view biomass negatively. It is therefore possible that significant effort may be required to convince influential and opposing actors of the merits of an energy strategy that envisages a major role for biomass.

Baseline sector analysis

Once the sector and key players are understood, an organisational structure agreed upon for designing the BEST, and the major actors are on board, the current status of the sector must now be researched, analysed and understood. This will enable the exact requirements of the strategy to be defined. The sector analysis is intended to establish the current energy supply and demand situation in the country.



Charcoal JIKO stoves seller, Kenya

© GTZ



Woman using biogas for cooking, Rwanda

© GTZ

Step 5: Establish baseline energy supply and demand situation

Introduction

The analysis of the prevailing energy situation should address both **qualitative and quantitative factors**. From the qualitative perspective, a complex set of economic, social, demographic, political and other factors influences a country's biomass energy sector. 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 economic impact of the sector, consumer preferences at household and commercial level, problems related to the development and organisation of networks, institutional weaknesses or shortcomings, cost distortions and trends, and relationships between (and interests of) key stakeholders. There may be a need for structured questionnaires targeting key informants as well as focus group discussions (especially to establish consumer preferences). Where relevant and possible, data should be disaggregated by gender. In countries with a significant percentage of female-headed households, it may be important to disaggregate data by female-headed and male-headed households.

A quantitative assessment is also required to establish the baseline supply and demand situation and to measure progress during implementation of the BEST. The types of information normally required are outlined below. In terms of methodology, existing studies on energy supply and demand should be consulted and vetted for quality and reliability. Many African countries lack reliable data on biomass energy supply and consumption. Even where these

data exist, very often they are not linked with each other or used in policy-making. Unreliable statistics may also be quoted and re-quoted, perpetuating false impressions. Therefore some original data collection will usually be required during BEST development. To be cost-effective it will be necessary to determine which data are essential for the process and which can be neglected. Sample surveys and robust estimates might prove more useful than lengthy research initiatives.

Socio-economic analysis

The starting point for baseline analysis is general **demographic parameters** such as population size, density and distribution, and projected growth rates by region and for rural and urban areas. This information is the basis for the actual and the expected number of people who have to be supplied with energy. Usually such information can be sourced from bureaus of statistics based on national census data.

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

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

If possible, these indicators should be disaggregated by sex (e.g. female-headed and male-headed households, sex of producer and trader, etc.)

This is potentially a very large volume of information and its collection may require extensive original survey work, in addition to the use of secondary sources such as household livelihood or socio-economic surveys. A balance will have to be struck between the desired amount of information and the resources available for BEST.

Energy demand

Demand for all types of energy should be estimated, focusing as far as possible on thermal applications (primarily cooking and the generation of heat). Demand can be described according to the following parameters:

- **User categories:** urban and rural areas, formal and informal sector, different income groups, male and female headed households, large and small industry
- **Consumption purposes:** domestic cooking, institutional and commercial cooking, heating, industrial use (e.g. brick burning, lime burning) and agri-business (e.g. tea drying, tobacco curing)
- **Fuel types:** quantities consumed (agricultural residues, fuelwood, charcoal, LPG, kerosene, electricity and others), typical household fuel mix, share of each source of energy (per household / in industry / total)
- **Fuel costs:** prices at different points in the supply chain, and end-user use costs considering the efficiency of production, conversion and end-use
- **Technologies used:** types (stoves, heaters, burners, dryers), availability, efficiencies



School lunches, Malawi

© GTZ/Christa Roth

- **Consumer preferences:** cooking patterns, fuel preferences, cost issues, affordability/ current spending

Methodologies for establishing energy consumption may include empirical surveys in households, institutions and businesses, monitoring of commercial woodfuel traffic to major urban centres, and gathering of commercial data on volumes and prices of fuels sold in the different markets.

Non-biomass fuels such as LPG, kerosene and electricity will often make a sizeable contribution to energy demand, especially in urban areas. It is important to analyse their:

- availability and reliability;
- rates of use;
- costs of fuels and types of devices used/ affordability;
- adoption factors/use for specific cooking types; and
- implications for increased uptake.

Most of this information will normally be available from utility companies and private-sector fuel suppliers.

Non-thermal uses of biomass should also be considered at a general level to indicate any competing demands for these fuels. Such additional uses may include:

- construction;
- furniture production; or
- export of wood or wood products.

Sample surveys may be required for a cross-section of industries to establish their consumption.

Energy supply

The supply systems for all major energy sources should be characterised and described.

For well-regulated sources such as LPG, kerosene and electricity, the information should be simple to get by consulting the main sector players and using available statistics. Characterising biomass energy supply may be more complex as it requires an assessment of standing biomass stocks and annual yields. This will be much easier if a national land use assessment (ideally using remote sensing technology) has recently been carried out, from which data can be extracted or extrapolated.

The following parameters are required to calculate biomass energy supply:

- Land cover listed by different categories (e.g. forests of different types, various forms of agricultural land, urban areas, water).
- Mean annual biomass production for each type of land cover (based on annual increments, rotations

and areas). This should include agricultural residues and animal wastes, as well as wood.

- Biomass actually available based on usable portion of annual increment and accessibility considerations (some sources will be too remote or subject to restrictions, such as reserves and parks).
- Resource ownership and management; who owns the identified biomass resources and the land on which they grow (by income, sex).

Taking these parameters in combination, an assessment of sustainably available biomass can be made, both nationally and for those regions where more detailed data exist.

Supply chain analysis

For a complete picture of the biomass energy sector it is necessary to quantify biomass energy flows to consumption centres and describe the networks' sociology and economy (especially in the charcoal sector), price breakdown at different points in the value chain, comparison of informal vs. formal producers, and the technology used for production.

The following specific elements should be considered:

- Organisation of woodfuel supply chain (including legal aspects)
- Annual volume and value of woodfuel industry
- Employment in woodfuel industry, by sex;
- Particular urban catchment areas
- Production, sales, use, availability and quality of improved woodfuel stoves

Major trends

Besides gathering data on the present situation, knowing existing trends is crucial if you are to understand the problems and identify key interventions. For instance some towns may be supplied by a surplus area of biomass, but could be 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 on the demand-side are:

- population growth;
- urbanisation rates;
- trends towards switching between energy sources; and
- pricing changes of biomass energy and other cooking fuels.





Step 6: Draw conclusions from baseline analysis

Once the information on the demand and supply of energy has been built up, a **picture of the overall situation at national and regional level** can be developed. Describing accurately the current balance between supply and demand can indicate how sustainably biomass energy resources are being used and hence how availability and pricing is likely to evolve. Even if there is no imbalance at national level, certain regions might suffer from biomass energy deficits. In the analysis, wood energy supply areas, consumption centres and the energy flows between them will have to be identified.

The **concept of sustainability** means that annual volumes of extraction should not exceed the mean annual growth. 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 supported as far as possible by quantitative data. A useful instrument to visualise the main parameters and highlight areas with a surplus, deficit or balanced use are **biomass energy maps**. Geographic information systems (GIS) can be helpful too, if available.

The conclusions should highlight **key issues** of the biomass energy situation. In particular, it should be possible to answer the following questions:

- What are the main biomass energy issues in the country?
- Are there any problems facing the energy sector, or more specifically the biomass energy sector (deforestation, indoor air pollution and other health issues, economic impact, illegal charcoal making, etc.)?
- Who are the most affected stakeholders?
- Which regions are most affected?
- What are the main obstacles to a sustainable biomass energy sector?

Defining the key issues of the current biomass energy situation and the main problems facing the sector will enable the BEST team to identify focal areas for the next stage. It will also establish the relevance of the sector for national development and can provide a convincing rationale for developing a BEST.

Step 7: Confirm the BEST scope, time horizon and process

The field of biomass energy covers a range of applications and options, not all of them 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 in the short term, in others not at all. Therefore the **scope of the BEST** should be defined, based on the findings of the sector analysis. The scope determines which key sectors will be covered and the level of geographical detail expected in the BEST (e.g. national or provincial level, or a tighter regional focus).

The BEST initiative recommends:

- A focus on the genuine, specific problems in each country and certain regions within the country.
- Taking the needs of biomass users as a starting point.
- Analysing both the demand and 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.
- Considering alternative fuels to substitute for biomass energy where it seems to be appropriate.

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 to address long-term goals. Timings in the national political system might also be important, such as dates of elections or phases of national development planning. It will be necessary to define not only the timeframe of the BEST development process, but also the period of time which the BEST interventions are expected to cover (e.g. 5, 10 or 20 years).

A map of the **strategy development process** should be defined. It is necessary to define who is going to do what. It is common for key tasks to be out-sourced to consultants, but in most cases consultants will (and should) work with seconded government staff to ensure institutional buy-in and build capacity in the responsible authorities.

Important **milestones** should be set, such as dates for meetings of the core team and steering committee, deliverables expected from the consultants and other contributors, deadlines for feedback on the deliverables from the core team and any workshops or other events at which the participation of additional stakeholders or the general public is envisaged. A rough time schedule for the process will mean that all stakeholders have a clear perspective about their involvement.

Decision point: Confirm agreement with sector analysis and evaluate whether there is sufficient evidence of government leadership to proceed.

Biomass energy is a broad, cross-sectoral topic, concerning a multitude of actors and dealing with complex systems. Having conducted the baseline study and established the current situation, the stakeholders must agree what happens next. There should therefore be agreement amongst the stakeholders about the sector analysis findings, the way the data have been interpreted, the conclusions that have been drawn and the implications they have for the next stages of the BEST process. This will lead to an **overall vision and clear scope for the strategy**, effectively representing Terms of Reference for the team responsible for its development.

The findings and conclusions of the sector analysis may be lengthy and complex. It is important that these findings are shared by the BEST core team amongst all relevant stakeholders to secure their feedback and inputs to verify their perceptions. Without a **joint understanding of the baseline situation**, there is no scope for discussing scenarios and making joint decisions.

Though apparently quite simple, this is a potentially complex process as it is possible – and indeed quite likely – that the baseline findings of BEST researchers or consultants may not correspond with official policy or the views of certain key stakeholders, either in terms of findings on the current situation or the envisaged direction of sector evolution. There is little point in proceeding with a strategy development which is at odds with official policy or which faces strong opposition from influential quarters, as it will then attract limited support from government. If there are influential stakeholders who disagree with the initial findings or their implications, this impasse must be resolved before continuing. This will require clear leadership from the key government members of the steering committee.



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Charcoal transport

In principle, three different options are possible at this stage:

- **Negative:** The preconditions for successful development of a BEST are not in place. Examples:
 1. The sector analyses are poor quality due to deficiencies in the composition or approach of the team of consultants, or of data availability.
 2. There are unresolvable differences in the perception of the current situation between government policy/ministry representatives and the stakeholders' or consultants' findings and vision.
 3. There is insufficient participation or demonstrated commitment from stakeholders.
- **Partly positive:** Important preconditions do exist, but certain conditions are lacking. Examples:
 1. The deficiencies in the quality of the sector analysis can be addressed through additional effort by the consulting team.
 2. Policy is supportive, but key departments or individuals with influence are not on board with the proposed vision for BEST. However, there is scope to resolve these differences through some lobby work and other activities.
- **Positive:** All conditions for strategy development have been met, with partners ready to proceed to the next phase. This decision should be formalised (e.g. in the form of a written agreement, including Terms of Reference for relevant actors for the next phases).

By now the baseline situation should be understood and the key stakeholders should have agreed the updated vision and objectives of the BEST and the timeframe, approach and responsibilities for its development. The next stage is to formulate scenarios for the development of the energy sector. How is the situation likely to evolve? What will happen under different assumptions?

Step 8: **Develop a “business as usual” projection of future supply and demand**

Ideally a baseline or “**business as usual**” scenario will be developed first, in which population growth, urbanisation and the country’s energy mix are assumed to evolve as per current trends. Based on the analysis of the prevailing situation conducted in Stage 2, the likely future development of biomass energy supply and demand is projected over a defined period, without changes in policy or other interventions. This baseline scenario should indicate the urgency of interventions and priority areas.

There are a number of computer simulation programmes available for developing such energy supply and demand projections, including the Synopsis Cooking Energy Simulation Model (SESIM), the Long-range Energy Alternatives Planning model (LEAP) and **GLOBUS**. Information on these models is available from EUEI-PDF or from GTZ HERA project – see inside front cover page for contacts.

Step 9: **Develop alternative scenarios**

One or more additional scenarios can be developed based on alternative assumptions, including both factors that can be controlled (e.g. taxation changes) and others that cannot (e.g. oil price fluctuations). These scenarios show the range of possible impacts in the long run and what the government and other stakeholders have to be prepared for. The development of alternative scenarios allows the implications of different interventions to be compared.

Possible variables that can be adjusted for scenario development include:

- Energy prices (to allow for different costs, taxes and levies, particularly for woodfuels, e.g. as new sources come online, or current sources are depleted)
- Rates of population growth
- Rates of urbanisation
- Proportions of households using different energy sources (e.g. based on wealth categories or urban/rural location)
- Relative mix of energy sources within households
- Scale and type of use of energy by industry
- Scale of energy imports
- Efficiency of energy use
- Availability and affordability of new energy sources

For each of the scenarios, the evolution of key indicators can be compared with the baseline scenario. The interrelation between variables is complex and probably perceived differently from different positions. It therefore remains crucial to involve relevant stakeholders and agree upon the importance of the specific indicators. Computerised programmes for scenario development can only be a tool to support decision-making. They cannot replace a qualitative discussion and balance between different opinions.

Besides the impacts, it is helpful to indicate the probable intervention costs of the different scenarios. For example, if an accelerated switch to electricity for cooking is envisaged by the government and is modelled under one of the scenarios, then the approximate costs of establishing and sustaining the requisite new power generation and distribution capacity should be estimated. The **cost–benefit ratio** is a helpful indicator in the decision-making process to guide the later selection of intervention strategies.

Step 10: **Re-assess stakeholder capacity**

An initial assessment of capacity in the sector was conducted at Step 3. Now that scenarios have been developed and it is clearer what steps need to be taken, it is necessary to look again at which stakeholders could potentially carry out these steps, and what **implementation capacity** each of them has. This assessment will need to address a range of government, private sector and non-profit organisations, and if in-country capacity is weak then

it may also need to consider requirements for capacity strengthening or for bringing in new organisations not yet working in the country or the sector.

This stakeholder assessment will go beyond assessing the human capacity of the individual employees working in the respective organisations. This is because the capacity of individuals is also dependent on the management structures and processes of the organisations in which they work. Moreover, the organisations themselves may be influenced by incentives and vicious/virtuous circles created by the wider institutional and structural environment. It follows that poor performance by individuals is often caused by poor governance, and this cannot be addressed through isolated activities that focus on lack of skills or training.

Therefore, a systematic assessment of stakeholder capacities must analyse **all levels of capacity**: the levels of individuals, organisations and institutional/structural environment. Such a Capacity Assessment can form the basis for targeted and strategic Capacity Development interventions. Note that some of the information collected earlier (during Steps 2 and 3) may be relevant and could be used and/or refined during the assessment.

Decision point: Evaluate whether there is sufficient common ground amongst all partners to proceed

The next stage in the BEST process will be to develop a **range of specific options for interventions** in the energy sector. It is therefore important that the scenarios are explained to the stakeholders and that a joint understanding of future trends based on the various assumptions is established. The stakeholders need to understand the implications of the scenarios and agree upon a common way forward.

Agreement also has to be reached on the **method** for drafting the strategy document during the next stage. Possibilities include drafting by consultants, by the core team or by a sub-group of a steering committee, in all cases with some form of peer review.

The outcome of the sector analysis and the scenario development may lead to a result that is not covered by the guidelines of the current energy policy. In such cases it will be necessary to determine what the next step should be:

- Continue with the BEST process, making a note of the inconsistency with current policy and the need to adjust the policy when it comes up for scheduled review. In some countries the development of strategies is seen as a source of innovation which informs a regular review of



Building a biogas plant, Rwanda

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policy (e.g. every five years). The need for this policy change must be explicitly accepted by the responsible ministry.

or

- If the need for this policy change is not accepted then the strategy will either have to be adapted to the existing policy or the process discontinued. This should not be viewed as a completely negative outcome. If the BEST process up to this point has led to serious and well-founded questions being raised about the achievability of current policies that impinge on the energy sector, then these questions cannot be delayed or overlooked. Raising them can result in a constructive dialogue with policy-makers that ultimately leads to a more pragmatic and workable policy. BEST itself can always be revisited later.



Safe paraffin stove design

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By now, the BEST vision and objectives will have been confirmed, a common understanding of the sector status will have been developed and stakeholders should have agreed on the preferred (or at least the most achievable) direction for the sector, based on the comparison of different scenarios. It is now necessary to develop a selection of interventions to achieve this preferred direction. The output of this stage is the BEST Strategy itself.

Step 11: Develop intervention options

The strategy's focal areas will have been defined by the baseline analysis, the projections and the strategic areas of action that have been agreed upon. Key interventions can be developed and classified in whichever way suits the country situation best, but it is typical to group potential interventions into the following broad categories:

1. Make biomass energy supply more sustainable
2. Make energy use more efficient
3. Promote viable alternative fuels
4. Develop institutional capacity for BEST implementation
5. Ensure a complementary and supporting environment outside the biomass energy sector

A selection of possible interventions under these headings is listed here, but the potential range for a particular country is of course unlimited. GTZ has commissioned a number of publications that provide practical ideas under each of these themes, including *Lessons Learned and Recommendations Covering Woodfuel Supply* (by Eco Consulting Group, 2009) and *Cooking Energy* (by EUEI-PDF, 2008).

The following is a selection of possible interventions by theme:

A) Make biomass energy supply more sustainable

For example:

- Develop a 'Woodfuel Supply Master Plan' for the main demand centres (including updated tree cover inventory, classification of commercial harvesting zones, assessment of accessible woodfuel resources by zone, market projections, analysis of woodfuel flows, development

of conditions and technical specifications for sustainable charcoal production).

- Develop District or Regional 'Woodfuel Management Plans' (including rehabilitation and better management of existing forestry resources, development of management and use structures at community level, introduction of supporting measures for sector officials and woodfuel extractors, plus additional support schemes such as training, awareness raising, funding and monitoring structures).
- Transfer responsibilities for management of forest resources to women and men in local communities (defining rules for sharing of responsibilities and coordination between government and communities with regard to co-management and exploitation).
- Identify and address barriers to private sector participation in woodfuel production (e.g. tax incentives, streamlined licensing procedures, niche market development).
- Establish scaleable pilots for certified woodfuel from sustainable sources (e.g. branded charcoal to supermarkets or eco-conscious institutional customers).
- Establish an efficient control system to address exploitation of resources, fiscal fraud, woodfuel transport to consumption centres, quality of production, etc.
- Increase the productivity of forest resources (e.g. through agroforestry, other on-farm tree planting initiatives or tree planting in dedicated commercial woodlots).

- Professionalise the charcoal value chain (e.g. through formal recognition of charcoaling groups, rationalisations and greater transparency in charcoal transportation, and adjustments to the tax regime to limit corruption).
- Modernise and strengthen woodfuel flow monitoring and control (e.g. improve the permit system for forest products, control system and computerised monitoring of charcoal flows and trade, and related tax revenues).
- Promote the use of improved, low-cost charcoal-making technologies for informal producers (e.g. improved pit kilns).

B) Make energy use more efficient

For example:

- Conduct R&D into energy-efficient appliances that may be cost-effective and marketable to future users.
- Investigate end-use appliances on the market, worldwide, and their suitability, or adaptability to the local market.
- Support efficiency improvements for institutional and commercial woodfuel users, including technological developments and financial support for better stoves, boilers, dryers and furnaces (e.g. institutional catering, commercial catering, tea drying, tobacco curing, brick and tile making, lime burning, fish smoking).
- Expand the range of appliances offered to consumers (e.g. improved stoves/furnaces) to reduce consumption of/pollution from woodfuel.

- Set up mechanisms to provide consumers (particularly women) in designated regions with access to better appliances and better regulated fuel (micro-credit or subsidies).
- Introduce complementary activities to further reduce woodfuel consumption (e.g. pressure cookers, haybox cookers, energy-saving cooking practices), with awareness raising, marketing programmes or commercial interventions as appropriate.

C) Promote viable alternative fuels

Viable is taken to mean accessible, affordable and socially and environmentally acceptable.

For example:

- Promote new and alternative fuels if appropriate for household, institutional or industrial use (briquettes made from agricultural residues or charcoal dust, coal, ethanol or methanol gel, peat, biogas or biofuels, and associated affordable cookers).
- Investigate and tackle bottlenecks to the uptake of viable energy alternatives, as long as those alternatives are cost-effective and desired by consumers.
- Investigate barriers to expanding the 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, over-taxation.

- Look into improving kerosene cooking appliances with better government standards and safer and more efficient models.
- Maintain a “technology watch” for new fuels or appliances that come onto the market.

D) Develop institutional capacity for BEST implementation

For example:

- Establish a Biomass Energy Agency or other empowered authority to manage BEST implementation. Such an agency could be under government or autonomous management, and the latter are often preferable in light of the largely private-sector nature of biomass energy value chains.
- Tackle legislation that is prejudicial to a transparent and sustainable biomass energy industry.
- Address any contradictions between existing policies and laws (e.g. forestry laws may endorse the production of woodfuels under licence, while energy laws may deter it).

E) Ensure a complementary and supporting environment outside the biomass energy sector

For example:

- Address the pricing of competing energy sources, such as electricity or liquid fuels, to ensure they are sustainable and pro-poor, and on a level playing field with biomass.
- Improve agricultural productivity to promote higher yields per unit of land and reduce pressure on woodfuel resources.

It might be helpful to propose **pilot programmes** in certain regions to determine the acceptance and effects of certain interventions. This can avoid misallocation of resources by first evaluating the potential before replication or scaling up. For example, the experience with the dissemination of alternative fuels and stoves cannot simply be transferred from one country to another without local feasibility trials.

Step 12: Seek stakeholder agreement on preferred interventions

The relative merit of the different intervention options has to be evaluated, taking into account their likely costs, available resources, the probable time horizon (short-term, mid-term and long-term) and the capacity that exists for implementation. Time is an important factor – switching from one cooking system or fuel to another is a

major behavioural change which requires human decision-taking – this takes time! For each potential intervention, quantified and time-bound targets should be established. Targets should be based on the long-term BEST vision but can also be aimed at shorter periods, such as two or four years.

The table below illustrates a method of comparing possible interventions qualitatively.

It is important to analyse the (desired or possibly unexpected) side-effects of the possible interventions. In some cases, the risk of negative effects might be greater than the targeted impact.

The end result should be a ranking of the available options, with those delivering maximum benefit for minimum cost in the shortest time obviously featuring most highly. It should of course be clarified who will be involved in the setting of targets and the ranking of the various options.

The ranked options should be consistent with the sector analysis and preceding collaborative processes, hence they will be the right things to do. But will it be feasible to implement them? This should be clear from the preliminary stakeholder analysis conducted in Step 2 and the more detailed assessment conducted in Step 10.

Possible intervention	Costs	Expected impact	Stakeholder involvement	Risks	Risk mitigation measures (examples)
Develop eco-conscious market opportunities for certified charcoal	Low	Short to medium term	High	Low	Start at a small scale with a few retailers and one supply chain
Create credit scheme for LPG cylinders and appliances	Medium	Short to medium term	Low	Low	Work initially with one LPG company to test the model
Develop and operationalise participatory forestry management plans	High	Medium to long term	High	High	Work in collaboration with other development partners for mutual reinforcement and leveraged impact, etc.

Once the priority interventions for the BEST have been agreed upon, an implementation Action Plan can be developed. This need not necessarily be part of the Strategy itself and could be a stand-alone document.

**Step 13:
Agree on priority actions**

Each intervention area must be translated into concrete activities (such as projects, programmes, legislative and regulatory measures). These should be as specific as possible in terms of responsible actors, timeframes, targets and resources required.

Activities should be designed, scheduled and undertaken according to their priority or urgency. A set of activities to be undertaken in a given period constitutes the **Biomass Energy Action Plan**. A typical time frame for an Action Plan would be one or two years, noting that of course some of the activities will be implemented over a longer period of time.

The BEST and its 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 country’s development partners.

For each activity agree who is responsible for implementation, who will contribute, when it should be undertaken and with what resources. This can be represented in a table (right). The assignment of responsibilities for implementation should be done together by the relevant stakeholders, e.g. through a national workshop.

Objective	Actions
1. Increase the supply of sustainable woodfuels	1.1 Develop and operationalise participatory forestry management plans 1.2 Develop eco-conscious market opportunities for certified charcoal 1.3 ...
2. Increase the efficiency of energy use	2.1 Develop a new urban charcoal stove costing < \$2 and at least 25% more efficient than existing models 2.2 Catalyse an institutional stoves business with technical support, credit and marketing assistance 2.3 ...
3. Promote viable alternative fuels	3.1 Introduce credit scheme for LPG cylinders and appliances 3.2 Conduct a feasibility study on charcoal briquetting from agri-residues or charcoal dust 3.3 ...
4. Develop institutional capacity for BEST implementation	4.1 Register an autonomous Bioenergy Agency 4.2 Seek start-up donor funding for the agency’s core operations 4.3 ...
5. Ensure a complementary and supporting environment outside the biomass energy sector	5.1 Convene a joint planning forum to engage energy and agriculture planners to address the interface between agricultural productivity and forest loss 5.2 ...

STAGE 5: ACTION PLANNING (continued)

The activities can be clustered according to (for example) fuel types, regional necessities or strategic areas of intervention – as described earlier. The last of these options may be the most workable, given that supply- and demand-side activities generally fall under different government departments, so a strategic division by type of intervention may be most implementable. This will, however, depend on the particular problems and opportunities that have been identified, as well as on the agreed goals of the BEST.

For each activity, **success indicators** need to be established. These indicators have to be precise and measurable, should include a defined source of verification and should be gender-sensitive. This will ensure that those taking responsibility will know how they are going to be judged, and will help suggest how progress can best be measured (see Monitoring and Evaluation page 28).

**Step 14:
Define responsibilities and timeframes**

It is necessary to document the planned activities, setting realistic deadlines and attributing responsible persons or institutions as shown in the example below. The necessary resources (financial, time, staffing) have to be defined in this planning process. Once a rough schedule is established, a calculation of costs can be made. Reasonably accurate figures will facilitate the task of **securing long-term funding** for those aspects of the BEST that require external financial support.

Objective	Actions	By when?	Who?	With which resources?
1. Increase the supply of sustainable woodfuels	1.1 Develop and operationalise participatory forestry management plans 1.2 Develop eco-conscious market opportunities for certified charcoal 1.3 ...			
2. Increase the efficiency of energy use	2.1 Develop a new urban charcoal stove costing < \$2 and at least 25% more efficient than existing models 2.2 Catalyse an institutional stoves business with technical support, credit and marketing assistance 2.3 ...			
3. ...	3.1 ...			

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

- What budget is needed to implement the planned activities?
- Where will it come from (national budget, private investment, donor contributions)?

It is important at this early stage to allocate sufficient resources for biomass energy in **national and regional budget planning**. With clear funding commitments from government, additional funds can often be mobilised from donors. To allocate resources and search for funding, it may be useful to include these measures:

- Develop mechanisms to mobilise local capital.
- Encourage greater involvement of local banks in biomass energy investments.
- Introduce smart subsidies for biomass energy initiatives, also as part of rural electrification (electrification together with improved biomass technology) programmes.
- Develop appropriate financing packages for SMEs in biomass energy projects.
- Promote technology acquisition through hire-purchase arrangements, e.g. for charcoal production technologies, institutional stoves, biogas, LPG appliances.

Step 15: Develop a monitoring and evaluation system

A systematic process of monitoring and evaluation is required to coherently manage the whole BEST process. It is also part of **internal quality management**, supports **individual and institutional learning** and meets **accountability** obligations to stakeholders and the general public. It will help to detect errors or new developments that will 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.

During the development of the strategy, suitable steps will already have been suggested to guarantee implementation by ensuring full stakeholder buy-in as a prerequisite for continuation at the end of each stage. Once implementation begins there must be sufficient financial resources and an effective management structure to coordinate and monitor the different activities.

Regular meetings between the BEST core team (or members of any newly created energy agency) and a group of important stakeholders can serve as a platform to monitor advances and discuss problems and opportunities which might occur during implementation. Such a group could meet for example every month and report to the leading ministries.

At a certain milestone (e.g. one year after starting implementation), an evaluation can be carried out by an **external organisation**. This will establish the degree to which BEST-proposed projects or programmes are achieving their set objectives. It will also ascertain the relevance, efficiency and results of those programmes and review their sustainability.

The suggested monitoring and evaluation procedure is to:

- Ensure that precise and measurable success indicators including, where relevant, by gender, have been established for each target during strategy formulation.
- Monitor action and impact: Besides monitoring advances in the planned actions there should be indicators to monitor the impact (expected and unexpected) of the interventions on women and men.
- Define roles and responsibilities: Who is responsible for monitoring implementation of the Action Plan and 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: take strategic corrective actions and adjust the key interventions.

There is no prescribed formula for ensuring the **official approval** of BEST. The way in which the Strategy is endorsed and launched will vary from country to country. Ideally, the members of the core team will ensure that a national ministry of planning or finance officially approves the Strategy, and this should automatically result in its adoption by the ministries or departments responsible for energy, forestry and other relevant technical specialities.

The **implementation** of the Strategy will follow the outline of the Action Plan. It may require changes in legislation, treasury and donor financial commitments, the establishment of new sector institutions, awareness-raising measures to disseminate the Strategy's key implications and a whole raft of measures that will ensure the implementation of its proposals.

For the foreseeable future, the majority of householders in Africa are likely to be cooking with biomass fuels. Adopting sound strategies can help ensure that these fuels are increasingly sustainable, and that improvements to the stoves and other appliances are adopted widely to reduce and eventually eliminate the damaging health effects on women and children. Biomass should be seen as a renewable fuel that can benefit everyone. But it will require enormous efforts by everyone involved.

Example:

Rwanda Biomass Energy Strategy (BEST), completed in 2009 and endorsed by the government, contains the following main elements:

- (I) Increase the sustainable supply of woodfuels. The result of this component is to make sure that in the future the supply of wood from non-sustainable sources stops completely and that the productivity of the sustainably managed resources is at a much higher level than today. This is expected to be done through the following activities: (i) improvements to the regulatory framework with regards to cutting permits and taxation policy; (ii) Efficient planning of woodfuel supply management activities; (iii) rehabilitation, better management and exploitation of State and District plantations; (iv) tree planting and increasing the productivity of private small-holder tree farms; and (v) professionalizing the charcoal value chain;
- (II) Increase the energy use efficiency. The result is that less energy will be needed for cooking than today. This is expected to be done through the following activities: (i) capacity building among equipment manufacturers and importers to make available modern appliances for the use of biomass; (ii) develop a mechanism based on a Quality Label to promote the use of these modern appliances; and (iii) launch a long-term publicity and awareness campaign to convince households, institutions and firms to adopt the new equipment;
- (III) Promote the production of alternative fuels, particularly based on peat, papyrus and typha as well as biogas if and when viable, and LPG for households and institutions (once taxes have been reduced), kerosene and some electricity.
- (IV) Develop the institutional capacity of Government organisations (concerned ministries, specialised agencies, local authorities) to deal with biomass in the short and medium term future on an equal footing as gas, petroleum fuels, and electricity.

Biomass is a broad term 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 commonly considered as waste, including food and drink manufacturing effluents, sludges, manures, industrial (organic) by-products and the organic portion of household waste. It excludes organic material which has been transformed by geological processes into substances such as coal or petroleum.

Biomass can be further 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 a refrigerator.

Traditional biomass

Traditional biomass is unprocessed biomass-based fuel, such as crop residues, fuelwood and animal dung. This fuel is **conditionally renewable**. However, the traditional way of using biomass is often not very efficient and can be linked to health problems. These common uses, combined with high population growth, may lead to an unsustainable use of this renewable source of energy. One development option is to improve the efficiency with which traditional biomass is used while at the same time reducing emissions (which is often referred to as the “modern use of traditional biomass”).

Modern biomass energy

Modern biomass is 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), but excludes the traditional uses of fuelwood in inefficient and polluting conversion systems.

Woody biomass

Woody biomass describes different forms of biomass based on wood:

- Fuelwood (or firewood), (e.g. logs or any other form that can be used in small stoves)
- Waste from wood-processing industries (e.g. bark, sawdust, shavings, offcuts and black liquor)
- Forest residues (e.g. thinnings, prunings or any other leftover plant material after cutting)
- Short rotation forestry (e.g. willow or eucalyptus)
- Woodlands/urban biomass (e.g. from tree felling, both domestic and municipal, as well as the green and woody portion of municipal solid waste)
- Processed wood (e.g. charcoal)

Improved biomass energy technologies

Improved biomass energy technologies (IBTs) are those that offer a step improvement over 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 less fuel being needed, which translates into direct cash or collection time savings. Improved charcoal production methods can significantly reduce the burden on forests. If adapted to the needs of 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.

Non-woody biomass

- Biomass from agricultural crops (e.g. various annual and perennial crops like miscanthus and switchgrass, but also many traditional agricultural crops like maize, rapeseed and sunflower) both used directly and converted to liquid biofuel
- Crop residues (e.g. rice or coconut husks, maize cobs or cereal straw)
- Processing residues (e.g. bagasse from sugarcane processing, olive marc from olive oil extraction, nut shells, coffee husks)

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. Biogas can be used for direct thermal applications or for generating electricity, though the latter is complex and costly.

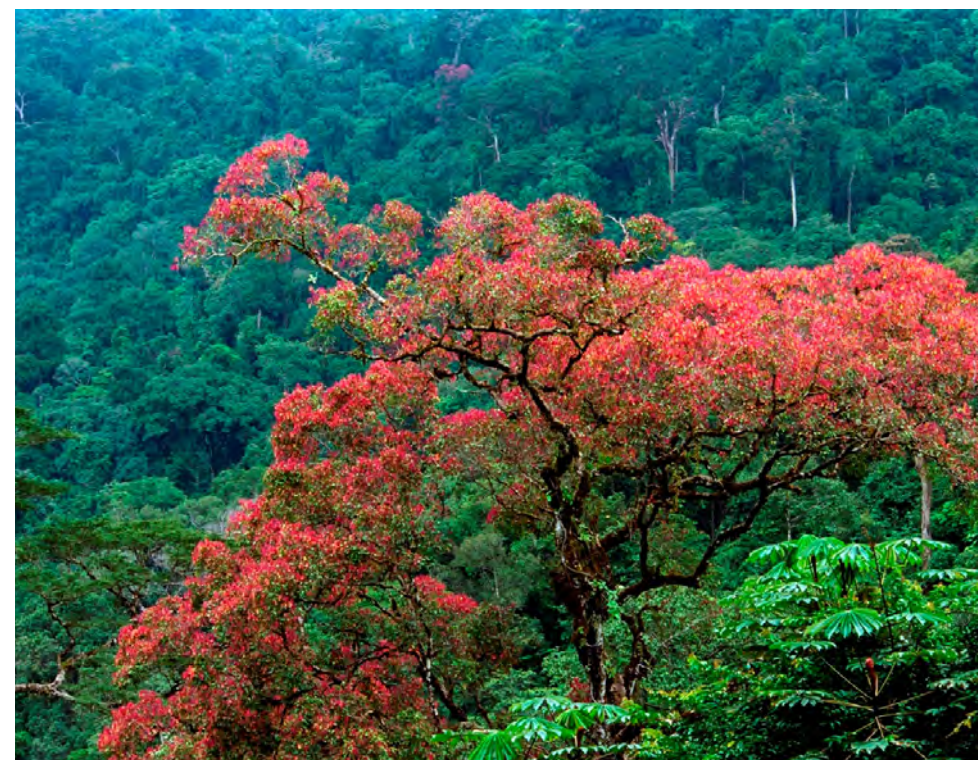
Liquid biofuels

Biofuels include bioethanol, biobutanol and biodiesel. Biodiesel and biobutanol are direct biofuels and can be used directly in petroleum engines. The potential to use biofuels efficiently in stoves is being assessed.

ANNEX B: RECOMMENDED STAGES IN THE BEST PROCESS

BEST development stage	Key elements	BEST development stage	Key elements
1. Stakeholder analysis and team formation	<ul style="list-style-type: none"> • Clarify vision and objectives of the Biomass Energy Strategy • Assess political and policy environment • Conduct stakeholder analysis • Assemble the BEST team • Decision points: Evaluate whether existing policies support the BEST objectives and whether the main stakeholders are providing sufficient support 	3. Development of scenarios	<ul style="list-style-type: none"> • Develop business-as-usual projection of future supply and demand • Develop alternative scenarios • Re-assess stakeholder capacity • Evaluate whether there is sufficient common ground amongst all partners to proceed
2. Baseline sector analysis	<ul style="list-style-type: none"> • Establish baseline energy supply and demand situation <ol style="list-style-type: none"> 1. Introduction 2. Socio-economic analysis 3. Energy demand 4. Energy supply 5. Supply chain analysis 6. Major trends • Draw conclusions from baseline analysis • Confirm the BEST scope, time horizon and process • Confirm agreement with sector analysis • Decision point: Confirm agreement with sector analysis and evaluate whether there is sufficient evidence of government leadership to proceed 	4. Development of the Strategy	<ul style="list-style-type: none"> • Develop intervention options <ol style="list-style-type: none"> 1. Make biomass energy supply more sustainable 2. Make energy use more efficient 3. Promote viable alternative fuels 4. Develop institutional capacity for BEST implementation 5. Ensure a complementary and supporting environment outside the biomass energy sector • Seek stakeholder agreement on preferred interventions

BEST development stage	Key elements
5. Action planning	<ul style="list-style-type: none">• Agree priority actions• Define responsibilities and timeframes• Develop a monitoring and evaluation system• What next?
6. Adoption and implementation of the Strategy	<ul style="list-style-type: none">• Endorsement• Launch• Implementation



Red flowering tree, Cameroon

© GTZ/Guenay Ulutuncok

Institutional and political aspects

The act of formulating the BEST should reveal the links between it and the primary reference frameworks, whether international (e.g. Agenda 21, CCD, UNFCCC, CBD), regional (e.g. the ECOWAS white paper, SADEC, CILSS) or national (e.g. PAN/LCD, biodiversity strategy, poverty reduction). This gives the biomass energy subsector 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. In some countries or locations there may also be a problem of gender-based violence and sexual harassment of women who are collecting firewood. The BEST should formulate specific recommendations for concrete actions, ensuring:

- the involvement of both women and men in the decision-making process;
- specifically addressing women's energy needs in the household and in the informal sector
- access by both women and men to the financial and other resources created by the BEST;
- the organisation of educational or training sessions specifically for women if necessary; and
- localised measures to address any identified problems of violence or sexual harassment.

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 assured by developing and implementing a true communications policy with solid supporting arguments, differing approaches for each target group and the use of appropriate communication 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.

Capacity development

Capacity development 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. Treating 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 include measures to accommodate 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.

Risks and flexibility

As with any human undertaking, the BEST may encounter problems during execution. The risks it may encounter must be clearly defined during development. These risks will be uncovered 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 implementation or revisions to taxation and regulations. The fact is that the proposed choices will essentially give the BEST 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 confusion, which would be a step backwards.

Assumptions contributing to the success of the BEST

To ensure a successful BEST, realistic assumptions must be made, understood, and accepted by all actors. These assumptions will vary with specific national requirements, but essentially they will cover:

- An institutional, legislative, and regulatory framework that creates the conditions necessary to enable actors to commit themselves (decision-makers, technicians, civil society organisations, general populations).
- Partnership with local governments, based on a realistic evaluation of their ability to deliver services to the target populations (e.g. the enforcement of regulations and the 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.