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ANNEX 5-3-4: Strategy report for improving financing

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COMPETE

**Competence Platform on Energy Crop and Agroforestry
Systems for Arid and Semi-arid Ecosystems - Africa**

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Project Partners

Participant role	Participant number	Participant name	Participant short name	Country	Date enter project (month)	Date exit project (month)
CO	1	WIP – Renewable Energies, Germany	WIP	DE	1	36
CR	2	Imperial College of Science, Technology and Medicine	Imperial	UK	1	36
CR	3	Utrecht University	RUUTR.STS	NL	1	36
CR	4	Stockholm Environment Institute	SEI	SE	1	36
CR	5	Austrian Biofuels Institute	ABI	AU	1	36
CR	6	Höhere Bundeslehr und Forschungsanstalt für Landwirtschaft, Landtechnik und Lebensmitteltechnologie Francisco Josephinum	FJ BLT	AU	1	36
CR	7	ETA - Energia, Trasporti, Agricoltura s.r.l.	ETA	IT	1	36
CR	8	European Biomass Industry Association	EUBIA	BE	1	36
CR	9	Practical Action	Practical Action	UK	1	36
CR	10	Consiglio Nazionale delle Ricerche	CNR	IT	1	36
CR	11	E+Co, Inc. (not funded)	E+Co	USA	1	36
CR	13	Institute for Sustainable Solutions and Innovation	ISUSI	DE	1	36
CR	14	AGAMA Energy (Pty) Ltd	AGAMA	ZA	1	36
CR	16	Center for Energy, Environment and Engineering Zambia	CEEEZ	ZM	1	36
CR	17	Environnement et Développement du Tiers-Monde	ENDA-TM	SN	1	36
CR	19	Food, Agriculture and Natural Resources Policy Analysis Network of Southern Africa	FANRPAN	ZIM	1	36
CR	20	FELISA Company Limited	FELISA	TZ	1	36
CR	21	Mali-Folkecenter	MFC	Mali	1	36
CR	22	MOI University	MU	Kenya	1	36
CR	24	Tanzania Traditional Energy Development and Environment Organisation	TaTEDO	TZ	1	36
CR	25	UEMOA - Biomass Energy Regional Program (PRBE)	PRBE	BF	1	36
CR	26	University of KwaZulu Natal	UKZN	ZA	1	36
CR	27	University of Cape Town - Energy Research Centre	UCT, ERC	ZA	1	36
CR	28	Chinese Academy of Agricultural Sciences	CAAS	CN	1	36
CR	29	Centro Nacional de Referencia em Biomassa, Brazil	GENBIO	BR	1	36

Project Partners (continued)

Participant role	Participant number	Participant name	Participant short name	Country	Date enter project (month)	Date exit project (month)
CR	30	Indian Institute of Science	IISC	IN	1	36
CR	31	The Energy and Resources Institute	TERI	IN	1	36
CR	32	Universidad Nacional Autonoma de Mexico	UNAM	MX	1	36
CR	33	Universidade Estadual de Campinas	UNICAMP	BR	1	36
CR	34	Winrock International India	WII	IN	1	36
CR	35	Interuniversity Research Centre for Sustainable Development - University of Rome "La Sapienza"	CIRPS	IT	1	36
CR	36	Universitetet i Oslo	UiO	NO	1	36
CR	37	University of Bristol	UNIVBRIS	UK	1	36
CR	38	University of Botswana	UB	Botswana	1	36
CR	39	University of Fort Hare	UFH	ZA	1	36
CR	40	TWIN	TWIN	UK	1	36
CR	41	Joint Graduate School of Energy and Environment	JGSEE	TH	1	36
CR	42	African Development Bank Group (not funded)	AFDB	Int.	1	36
CR	43	Energy for Sustainable Development Ltd.	ESD	UK	1	36
CR	44	Eco Ltd.	Eco	UK	1	36
CR	45	Chinese Association of Rural Energy Industry	CAREI	CN	1	36
CR	46	Food and Agriculture Organisation of the United Nations (not funded)	FAO	Int.	1	36
CR	47	Conservation International Foundation (not funded)	CI	USA	1	36
CR	48	Foederation Evangelischer Kirchen in Mitteldeutschland	EKMD	DE	1	36

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LIST OF ACRONYMS

ACAD	African Carbon Asset Development Facility
ACCE	African Carbon Credit Exchange
AFC	African Carbon Forum
AREED	African Rural Energy Enterprise Development
ASYCUDA	Automated System for Customs Data
CAPEX	Capital Expenditure
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
DANIDA	Danish International Development Assistance
DNA	Designated National Authority
DOE	Designated Operational Entity
DSCR	Debt-Service Coverage Ratio
EB	Executive Board
EIA	Environmental Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ETS	Emissions Trading System
FIT	Feed-In Tariff
FT-diesel	Fischer-Tropsch diesel
GEF	Global Environment Facility
GHG	Greenhouse Gas
GKI	Green Knowledge Institute (part of ACCE)
CO ₂	Carbon Dioxide
IETA	International Emissions Trading Association
IPP	Independent Power Producer
MFP	Multi- Functional Platform
MININFRA	Ministry of Infrastructure and Energy (Rwanda)
mtoe	mega tonnes of oil equivalent
NGO	Non governmental organisation
NTB	Non-tariff trade barrier
OGM	Out grower module
OPEX	Operational expenditure
PDD	Project Design Document
PIN	Project Identification Note
PPA	Power Purchase Agreement
PPP	Public-Private Partnerships

RD&D	Research, Development and Demonstration
RE	Renewable energy
RES	Renewable energy sources
ROE	Return on Equity
ROI	Return on Investment
SSA	Sub-Saharan Africa
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
TBL	Triple Bottom Line
VER	Verified / Voluntary Emission Reduction
WB	World Bank

SUMMARY

INTRODUCTION

The main purpose of this deliverable D5.4 'Strategy report for improving financing' is the development of ***potential solutions on how to facilitate the financing of bioenergy projects in Sub-Saharan Africa***. Four main areas are addressed that are particularly important in achieving this objective: i) ***policy*** (policy development enhancements); ii) ***financing*** (access to / supply of financing, the carbon market, etc.); iii) ***trade*** (options that facilitate trade in the areas of infrastructure, policy and markets) and iv) ***markets*** (i.e. the link between the financing of bioenergy ventures and any relevance to the development of related markets in Africa – taking into account demand, supply and carbon market-related aspects). In the context of this deliverable the perspectives of both, project developers as well as project financiers are taken into account.

The sources utilised to complete this deliverable have been a mix consisting of primary and secondary data compilation and analysis. Of particular relevance to this deliverable have been the results of the market survey undertaken as part of this Work Package (i.e. D5.3 'Survey on funding opportunities').

BACKGROUND

Biomass is by far the main source of energy in Africa, however, almost all of the biomass utilised for cooking, heating and small industrial production is in the *traditional* form, i.e. woodfuel, charcoal and residues from agricultural and industrial processes [16]. The use of *modern* bioenergy in Africa is generally restricted to where industrial residues are available on-site, such as sugar factories and timber mills.

Despite the already very high consumption rate of biomass, Sub-Saharan Africa has the biggest bioenergy potential out of all major world regions. This is due to four main reasons, namely large areas of suitable cropland and pasture currently unused, the low productivity of agricultural production and the low labour cost. Yet, this huge bioenergy potential is largely untapped for a variety of reasons, the most relevant ones being related to -lack of investor security; -insufficient access to and supply of financing; -infrastructure and technology deficits; -inadequate or lacking regulatory frameworks; -political instability and legal uncertainty; -land competition and feedstock-related issues; as well as -trade barriers and -a slow rate of development of the carbon market.

POTENTIAL OF MODERN BIOENERGY FOR SUB-SAHARAN AFRICA

The development of modern bioenergy systems offers significant opportunities for Sub-Saharan Africa to improve the low yield subsistence farming-dominated agricultural sector, mostly in regard to energy, socio-economic and environmental aspects. This not only represents a promising means to improving access to energy and to reducing GHG emissions, but most importantly, it presents opportunities for African countries to attract associated investment and technology flows. However, despite the evident potential of bioenergy -including biofuels- in Africa, these kinds of ventures have been facing a number of complexities across the entire value chain, mostly related to policy development, supply chain (including feedstocks and infrastructure), land competition, trade, market development and in particular with respect to access to and supply of financing.

SPECIFIC CHARACTERISTICS OF BIOENERGY PROJECTS AND VENTURES

Every commercial venture requires close consideration of the underlying specific characteristics and its risks and opportunities. The specific nature of bioenergy ventures (e.g. in comparison to other types of renewable energy projects) is multi-faceted and includes the following aspects: -reliance on long-term supply of feedstock; -general bioenergy market complexity and market

structure; -unpredictability of output of bioenergy projects; -'food versus fuel' debate; -perceived risk profile of bioenergy projects and an -increased importance of the underlying policy framework.

The next section covers the core of this deliverable, i.e. the four main areas contributing to facilitating the financing of bioenergy projects in Sub-Saharan Africa, namely a) policy development, b) financing, c) trade and d) development of markets.

A) POLICY DEVELOPMENT

POLICY DEVELOPMENT - OVERVIEW

Given that only continued innovation and the large-scale deployment of bioenergy technologies will result in the required economies of scale that will eventually translate into a cost per unit of bioenergy at or below the retail rate of fossil-fuel based transport fuels / grid power, it is crucial to create a framework that strengthens the continued development of markets for bioenergy. The positive correlation between a supporting policy framework and an improved cost competitiveness of bioenergy therefore has a beneficial impact on both, the financial viability of bioenergy projects as well as on investor security.

POLICY DEVELOPMENT - ISSUES

There are a number of issues around bioenergy-related policy development in Africa, including: -competition of bioenergy with other areas (e.g. security of food supply / land competition; resource competition; market and lobbying power of fossil fuel industry); -issues with a direct impact on investors (e.g. political and regulatory risk; unfavourable regulation regarding moving investments in and out of countries and reinvesting profits) and -other issues (e.g. lacking awareness and/or understanding regarding benefits of bioenergy; unsuited sites; insufficient management capacity).

POLICY DEVELOPMENT - POTENTIAL SOLUTIONS

The potential solutions around bioenergy-related policy development in Africa are mainly in the following areas:

- Removal of regulatory risk through (*direct*) *government policy support*, e.g. -establishment of binding blending requirements; -creation of financial incentives for bioenergy (e.g. subsidies and grants); -potential creation of PPAs¹/FITs² (for bioenergy power producers); -differential taxation (either increasing taxes -i.e. price- of competing energy sources or lowering taxes for bioenergy); -creation of a stable and reliable legal framework supportive of bioenergy; -support to advance bioenergy-related RD&D³ activities.
- Other aspects, such as -setting up of pilot and demonstration projects; -knowledge sharing support; -simplification of bureaucracy; -governmental loan guarantee programmes; -counteracting inflation and depreciation and general uncertainty in the economy.

The importance of a well thought-out bioenergy policy making process can also be illustrated by its potential to support solutions that address one of the most important issues in the development of bioenergy, i.e. the food versus fuel issue. One important means of addressing this issue is the development of 2nd generation biofuels. 2nd generation biofuels⁴ have the advantage of *not* using feedstock that could also enter either the animal or human food chain – instead, non-food crops (or

¹ Power Purchase Agreements

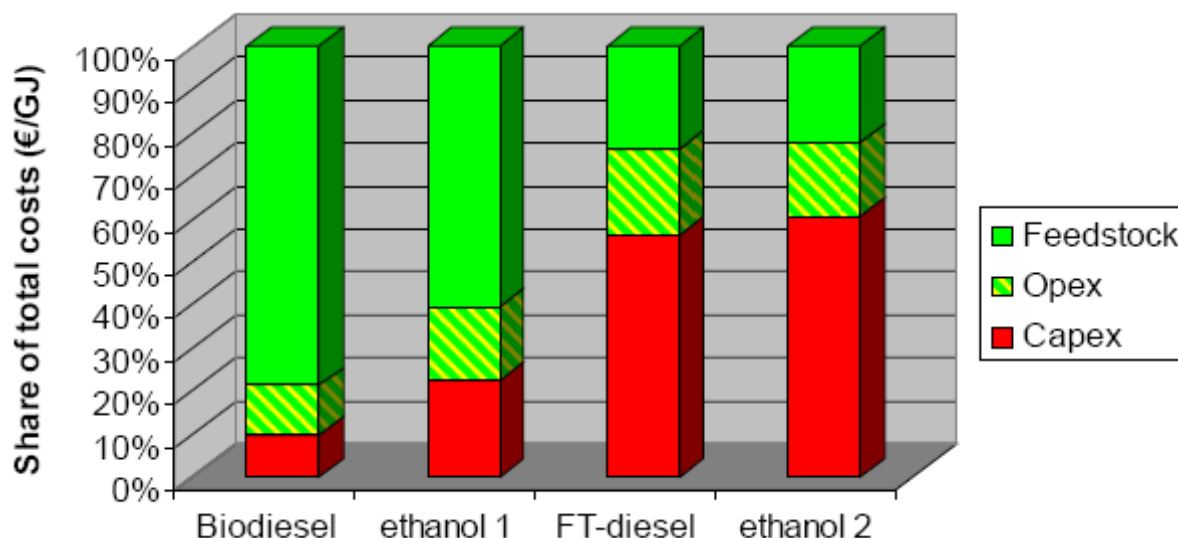
² Feed-in-Tariffs

³ Research, Development & Demonstration

⁴ The second generation alternative for biodiesel would come from Fischer-Tropsch diesel (FT-diesel) and for bio-ethanol from ethanol produced from lingo-cellulosic feedstock, or methanol and hydrogen from lignocellulosic feedstock

their residues) are utilised, thereby providing a solution to the food versus fuel discussions. However, 2nd generation biofuels are currently at the (policy susceptible) RD&D stage, so any policies also supporting their further development and potential market entry need to take into account the underlying risk profiles of both 1st and 2nd generation biofuels. These are illustrated by the figure below and demonstrate a shift from a current susceptibility to changes in *feedstock*, i.e. commodity prices (for 1st generation biofuels) to a susceptibility to changes in *CAPEX*, i.e. investment costs (for 2nd generation biofuels). A bioenergy-related policy framework that attracts investment flows into these technologies will therefore also be beneficial for the development of 2nd generation biofuels, thereby contributing to finding solutions for the food versus fuel issue.

Figure 1: Relative shares of feedstock costs, operational expenditures (Opex) and capital expenditures (Capex) in total biofuel cost price for different biofuels [3]



B) FINANCING

FINANCING - OVERVIEW

One of the key challenges that bioenergy project developers in Africa face is securing financing for the various stages of their ventures. The three main types of financing required are: at risk development funds to develop the initial business idea into a venture; development funding to bring in and do work on projects; and long-term equity / long-term debt and working capital.

Of particular difficulty for project developers in this context is to raise money for the early-stage development of their business, i.e. business idea, pre-feasibility and feasibility. Given that the bioenergy market in Africa is a young and high risk market (in turn making it difficult to attract financiers' interest and/or their investment comes at a high price for project developers), most of the sources of the funds for early-stage bioenergy project development are either own equity, forward sales of project outputs or at risk funding in exchange for large equity share. As a result, there is a positive correlation between project development progress and access to external funding, i.e. the further a bioenergy project in Africa has progressed within the project development cycle, the easier it is for project developers to get access to external funding⁵.

⁵ A result coming out of primary market research undertaken as part of this work package, i.e. D5.3 'Survey on funding opportunities'

FINANCING - ISSUES

Issues around access to / supply of financing:

One of the biggest, if not *the* biggest challenge that bioenergy project developers in Africa face is access to financing of their ventures. Common issues in this context are related to a number of aspects, including -the nature of bioenergy projects in general (e.g. technology, feedstock, landownership risks); -requirements set by the financing sector (e.g. collateral requirements, strict risk management approach, high interest rates, very limited willingness to accept carbon financing as a collateral); -current state of financing sector (e.g. lack of in-house expertise within financial institutions regarding bioenergy project evaluation, long application and approval procedures of bioenergy financing requests); -current state of bioenergy development industry (e.g. lacking in-house expertise to secure funds, prepare bankable pre-feasibility and feasibility studies, and negotiate with lenders to obtain the most favourable financing terms); -financial strength of small-to medium-sized bioenergy project developers (e.g. lack of untied assets and/or lack of financial strength to mobilise guarantee instruments in lieu of asset-based collateral); -project/venture size, type and viability (e.g. struggle of small/medium ventures to attract interest from financial institutions due to disproportionately high requirements in terms of transaction costs / due diligence); -availability and dissemination of bioenergy-relevant information for all financing stakeholders; -perceived high risk profile of bioenergy projects.

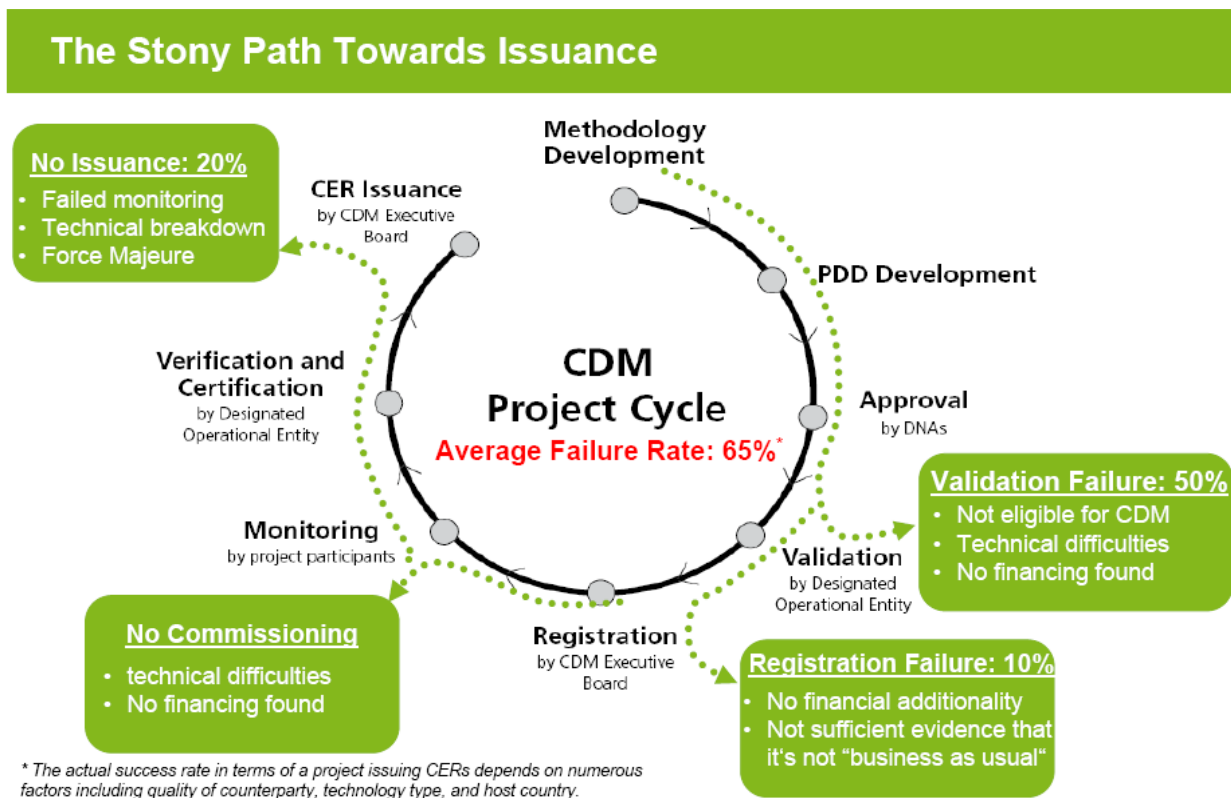
Issues around other areas:

These include -early-stage bioenergy project financing issues (e.g. proven feasibility, i.e. bankable feasibility study / business plan as a minimum requirement); -venture ownership issues (e.g. difficulty for project developers to accept capital from sources requiring a large equity share for a loan); -infrastructural issues (e.g. low electricity access and metering conditions across most African countries, impeding the use of related incentives to promote bioenergy).

Issues around the carbon market:

There are a number of issues undermining investor confidence regarding carbon finance revenues / the future carbon price and therefore the future of the compliance and voluntary carbon markets as a whole, including -inexperience with and uncertainty about the (post-Kyoto) global carbon markets; -the general complexity of the carbon markets; -widespread inadequate on-the-ground carbon market-related capacity and expertise; -high and even increasing transaction costs of carbon projects; -a smaller (and decreasing) number of large-scale carbon project opportunities; -other, more project specific issues, including host country risks (financial & regulatory), additionality issues or underperformance due to faulty monitoring / delays in issuances.

Aside from the issues mentioned above, the graph below illustrates a more general overview of possible failures along the CDM project cycle, including validation, registration, commissioning and issuance failures. The graph demonstrates an average failure rate of 65%, with a negative correlation between CDM project cycle progress and failure risk.

Figure 2: Risks along the CDM project cycle [11]

In terms of the contribution of revenues from carbon credits in comparison to the overall cost of bioenergy projects in Africa, this varies between 2% and 25%⁶ (depending most of all on the project type), indicating that while carbon credits can make a contribution to the financial viability of bioenergy projects, other aspects of project financing are far more important in this context.

FINANCING - POTENTIAL SOLUTIONS

The potential solutions which can contribute to facilitating the financing of bioenergy projects in Africa are mainly in the areas of access to/supply of financing, the carbon markets and other areas:

Potential solutions around access to / supply of financing:

Market intelligence: -creation, maintenance and making available (online and offline) of a comprehensive database of potential financiers/investors that are active in African bioenergy markets; the database should be built on and linked to existing documentation providing potential sources of financing, such as the Global Bioenergy Partnership's (GBEP) 'Financing options for bioenergy projects and programmes'.

Financing sector - requirements and supply of funds: in order to facilitate access to financing of bioenergy projects, bioenergy project developers have identified a number of aspects that the financing sector should consider to improve: -shortening and simplification of application and approval procedures for financing; -provision of more speculative and up front bioenergy-related funding – secured through diversification and risk mitigation across multiple projects; -development of/provision of insurance products to mitigate certain types of bioenergy-related risks; -microcredit, especially in small scale bioenergy projects, can be used as a financing template;

⁶ As identified by the results of the market survey undertaken as part of this Work Package (i.e. D5.3 'Survey on funding opportunities')

Renewable energy investment facilities: low interest capital for bioenergy projects could be provided through the establishment of special purpose national/regional renewable energy funds/investment facilities with financial institutions (potentially complemented by donor money);

Capacity building: provision of training to improve the financing sector's understanding regarding bioenergy, for instance in terms of knowledge of bioenergy technologies, risk assessment, etc.;

Potential solutions around the carbon market:

National level: -provision (online and offline) of i) simple and easily understandable documentation to introduce the concept behind the carbon market, as well as national and international opportunities and issues relevant to carbon financing in Africa and ii) a database of African carbon market players and of existing African carbon projects, utilised methodologies, etc.; -shortening of the Designated National Authorities (DNA) approval process and increase of staff (availability) within DNAs;

Capacity building: -documentation and training sessions (for instance integrated into the offer of bioenergy one-stop shops) concerning the opportunities and risks of the carbon market in Africa, as provided for instance by the Green Knowledge Institute at ACCE (African Carbon Credit Exchange); -creation, dissemination (online and offline) and maintenance of a 'carbon market best practice' database; -information/guidance on how to identify and secure up front purchase commitments for carbon credits;

Carbon trading activities: -dissemination of more in-depth information regarding carbon trading (i.e. the buying and selling of carbon credits) and its opportunities and risks in the African context; -a strong enough supporting framework (i.e. adequately skilled human resources, technology, regime certainty, development of methodologies appropriate for Africa, innovative financing, etc.) to promote the further development of these activities on top of the two key market players in the area of carbon credit trading activities in Africa, i.e.

- the African Carbon Credit Exchange (ACCE) headquartered in Lusaka, Zambia: offering i) a trading platform, ii) a 'Low Carbon Africa Fund Portfolio' and iii) 'Green Knowledge Institute' and
- the African Climate Exchange (ACX) headquartered in Addis Ababa, Ethiopia offering i) capacity building, ii) project evaluation and approval, iii) project finance, iv) project management and oversight and v) market facilitation.

Other potential solutions around the carbon market: -streamlining of carbon finance approval process (i.e. making it shorter and more predictable, e.g. reducing transaction costs); -continued efforts to develop risk sharing or risk mitigating mechanisms for carbon financing.

Potential solutions around other areas:

Other potential solutions not covered by the previous two areas that can facilitate the financing of bioenergy projects in Africa include: -one-stop shops for bioenergy project developers and project investors (i.e. nationally/regionally centralised bioenergy facilities (potentially government-subsidised) in the form of both physical, on-the-ground, as well as online portals serving as central hubs of information exchange regarding bioenergy aspects); -other types of bioenergy enterprise development support (e.g. provision of standard documentation for bioenergy market players, such as spreadsheet models, legal documentation, risk analysis tools/risk mitigation instruments or basic engineering support); -trade of bioenergy products (provision of export/import finance support to increase the chances of (further) development of regional, national and international export/import markets for bioenergy products, such as raw materials or biofuels); -national support measures (e.g. renewable portfolio standards requiring electricity suppliers to source a percentage of the energy e.g. from bioenergy, creation of bioenergy bodies/associations to facilitate the communication process between government, developers and financiers); -dissemination of good practice examples in other African countries.

C) TRADE

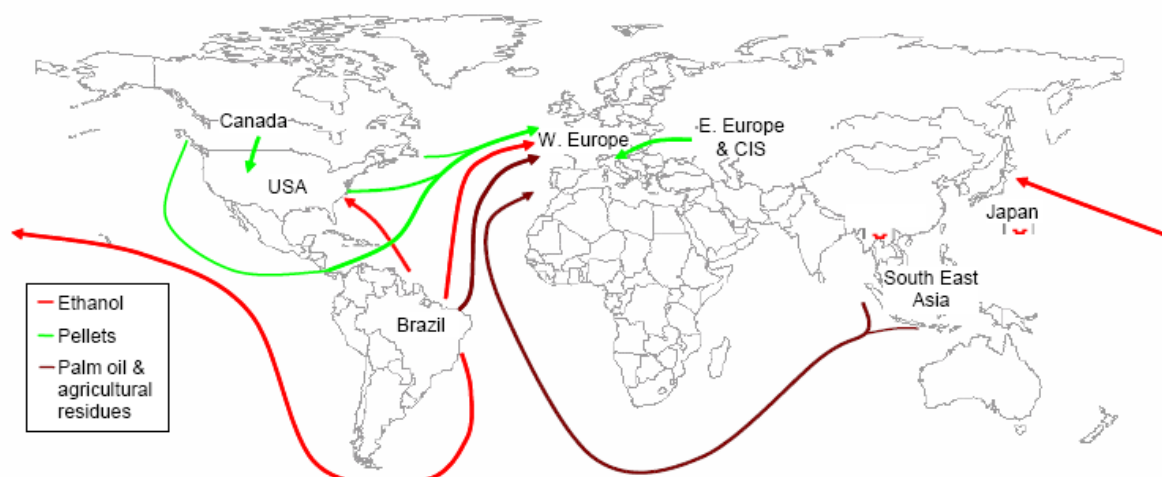
TRADE - OVERVIEW

The main drivers for international trade of biomass/bioenergy are the (high and volatile) oil price, as well as global policies and regulations regarding i) obligations to reduce greenhouse gas emissions, ii) biomass used for energy generation (electricity, heat) and iii) blending regimes to replace fossil fuel-based transport fuels with biofuels [10].

However, despite the potential opportunities for exporters⁷ and importers⁸ resulting from bioenergy trade activities⁹, there are a number of reasons that present significant hindrances regarding the development of trading activities of bioenergy(-related) products in Africa. The types of barriers in this context can be direct or indirect issues and include political/regulatory, economic, technical, logistical and legal barriers, issues regarding project scope and land availability, as well as potential conflicts with food production.

Overall, there have been high growth rates for bioethanol, biodiesel and wood pellets-related production and trade on a global scale. However, Africa is largely excluded from these growth trends, with African bioenergy-related trading activities currently being very small (an exception being for instance bio-ethanol exported from Congo, Swaziland and Zimbabwe and wood chips and particles exported from South Africa)¹⁰. This is confirmed by the diagram below illustrating the international bioenergy shipping routes.

Figure 3: Main international bioenergy trade routes [4]



TRADE - ISSUES

Issues with a negative impact on bioenergy trading activities in Africa are mainly in the following three areas:

Infrastructure/logistics-related issues: -generally bad infrastructure in Africa making transport of physical goods and therefore trading challenging and costly; -land transport costs are generally

⁷ e.g. sustainable management of natural resources, agricultural diversification, additional income, increased employment, reduction of poverty – all which especially important for rural communities

⁸ e.g. fulfilment of GHG emission reduction targets in a cost-effective manner, fuel mix diversification, more sustainable energy production

⁹ as already established in earlier trade-related work of COMPETE's WP5, i.e. D5.5 'Synthesis report on international trade'

¹⁰ Source : [28]

much higher than transport by sea; -port inadequacies, i.e. e.g. low port productivity and insufficient facilities for handling/storage; -insufficient availability of suitable vessels for international sea transport of biofuel and biomass products.

Regulatory / policy issues: -strong dependency of international trade prospects of bioenergy products (most of all of biofuels) on European and American trade and agricultural policies; -existence of governmental support schemes, such as tax exemptions and subsidies for biofuel production (especially in developed countries); -import tariffs are too high in many potential target markets; -imposition of export tariffs mostly levied on feedstocks/raw materials in order to create incentives for investment in the production of the final product (e.g. biofuels); -loopholes in relevant legislation thereby circumventing for instance import tariffs; -sustainability criteria / sustainability certification systems creating bioenergy trading-related issues, mostly for developing countries; -patchy global GHG emission reduction obligations; -political activities in some countries resulting from negative reaction to biofuels (e.g. food-versus-fuel issue, sustainability doubts); -negative impact of non-tariff barriers on bioenergy trading activities, e.g. in terms of trade liberalization, business costs and market access.

Other issues: -uncompetitive production costs of biofuels in Africa; -limited commercial viability of trade of bioenergy by-products; -insufficient technology transfer and capacity building; -uncertainty of future availability and price of biomass feedstock;

TRADE - POTENTIAL SOLUTIONS

Potential solutions that can promote bioenergy trading activities in Africa are mainly related to areas of regulation / policy, infrastructure and economy / market. Most of the suggested measures have the potential to create additional and/or get better access to existing sales and trading markets for bioenergy products, in turn improving the opportunities to finance bioenergy projects. However, given the scale required to offset transaction, transport and other costs in this context, trade of bioenergy products mostly benefits larger bioenergy project developments. Small-scale bioenergy projects in Africa (which are a particular focus of the COMPETE project) can therefore tap the trade-related potential benefits best when being part of a larger network, for example an outgrower scheme.

Overall, the main aspects carrying a potential to boost bioenergy trading activities are related to the following areas: -creation of new markets for agricultural products (particularly useful for rural communities), -policies regarding biofuels for transportation purposes (bioethanol, biodiesel), -policies for use of biomass for heating and electricity generation (e.g. wood pellets) and on a more global level, -energy security, -GHG emission reductions and -fossil fuel prices (particularly oil) – with the latter two aspects being deemed by the market to have the biggest impact on bioenergy trading activities in Africa.

Infrastructure / logistics-related potential solutions:

-improvements and expansions of distribution and transportation infrastructure; -securing of local markets for bioenergy products; -strategic locating of biofuel-related infrastructure (e.g. distilleries close to ports to enable delivery by sea); -promotion of technology transfer; -improvement of maritime shipping capacity (i.e. suitable vessels, port facilities and port productivity); -other measures to minimise the risks related to enabling low cost, reliable and efficient transport of biofuels and solid biomass (e.g. establishment of consortiums of biomass shippers and/or bioenergy transport investment funds).

Regulatory / policy-related potential solutions:

-increase in government support for national biofuel industries (e.g. subsidies/grants to build the necessary biofuel production infrastructure for biofuel feedstock production, and fuel-excite taxes/tax credits/grants awarded for the production, sale and blending of biofuels); -reduction of tariffs or waiving of duties altogether (e.g. through the promotion of preferential trade arrangements between target markets and African countries [10]); -minimisation / removal of non-tariff barriers (NTBs) (e.g. arbitrary NTBs, i.e. corruption, lack of suitable training and lack of harmonisation and

customs administration NTBs, i.e. ineffectiveness and inefficiency of customs administration); -lowering of unjustified technical standards of biofuels (unreasonably high technical standards inhibiting biofuel trade, including technical standards either in the form of physical and technical properties of the biofuels themselves or as maximum percentages of biofuels allowed to be blended with vehicle fuels); -creation of technical standards for wood pellets (e.g. establishment of internationally aligned, recognised and enforced technical standards for criteria such as durability, ash content or size); -sustainability criteria / certification systems for biofuels (e.g. enforcement of sustainability criteria / certification schemes as part of mandatory regulation for biofuel feedstocks, production processes and end products); -further trade liberalisation activities across Africa (e.g. on top of the creation of the expanded free trade zone in 2008 covering over 30 African countries, i.e. member countries of COMESA (Common Market for Eastern and Southern Africa), SADC (Southern Africa Development Community) and EAC (East African Community)).

Economic / market-related potential solutions:

-increase in scale of production / factory size (i.e. improving (cost) competitiveness of African biofuels); -establishment of local production capacity (e.g. promoting local partial assembly of otherwise imported products, thereby minimising imports of bioenergy-related products); -development of niche markets for biofuels (e.g. airline biofuel trial projects).

D) DEVELOPMENT OF MARKETS

DEVELOPMENT OF MARKETS - OVERVIEW

Development of markets (i.e. the relevant aspects around the link between the financing of bioenergy ventures and any relevance to the development of related markets in Africa) covers for instance the different types of markets available to project developers at the different business development stages relevant for bioenergy venture development. However, these markets are often poorly developed in most parts of Sub-Saharan Africa, indicating some degree of market failure in this context with respect to the provision of these different types of financing.

Given the nature of the bioenergy market in Africa, the types of funding that project developers in Africa require to finance their bioenergy ventures are mostly across the early-stage business development cycle stages, i.e. seed phase (phase requiring at risk speculative development funds to develop an idea with the objective to turn it into a financially self-sustained business), start-up phase (phase requiring further development funding to bring in further projects, clients and revenue) and growth phase (phase requiring additional long-term equity/long-term debt and working capital to finance further growth).

DEVELOPMENT OF MARKETS - ISSUES

The issues in this context are related to different aspects of financing of African bioenergy ventures and its relevance to the development of related markets, in particular a) from the demand side, b) from the supply side, c) from other aspects and d) in relation to the carbon market.

Issues with relevance to the development of related markets – demand side aspects:

-generic difficulties of project developers in getting access to financing (e.g. widespread unawareness of project developers of the full picture of the various market players in the bioenergy venture development markets); -frequent lack of various venture development skillsets (particularly applicable to small-scale bioenergy ventures and covering e.g. the development of (pre-)feasibility studies or a bankable business plan); -challenges that project developers face in terms of finding affordable solutions to the implementation of required legal documentation;

Issues with relevance to the development of related markets – supply side aspects:

-potential issues affecting investor security (e.g. the (non-)existence of national regulations that potentially impact the free movement of investments and/or profits in and out of countries); -small projects' difficulties to attract financing (e.g. to recover the transaction costs involved in the provision of financing for bioenergy developments in Africa); -unawareness of value of 'intermediate-stage' bioenergy developments (e.g. there are separate markets for pre-feasibility studies / feasibility studies / business plans – options which bioenergy financiers are usually unaware of); -shortage of relevant insurance products (e.g. products offered for project developers to insure bioenergy ventures against failure); -strict loan security requirements for project developers; -assessment criteria of bioenergy investment opportunities (e.g. insufficient emphasis on the importance of non-financial criteria, such as in the Triple Bottom Line approach); -mismatch of suitability of financing instruments to respective project development cycle;

Issues with relevance to the development of related markets – other aspects:

-identifying and securing target markets for bioenergy products; -insufficient collaboration project developers - R&D activities (e.g. identifying and growing the most suitable feedstock in a given area); -unsatisfactory level of local technical expertise (including installation, maintenance and decommissioning of bioenergy technologies); -infrastructure deficits across Africa (e.g. generation and distribution of electricity from bioenergy and manufacturing, transport and trade of bioenergy feedstock and (by-)products); -land ownership issues (which is restricted for foreign investors in many African countries).

Issues with relevance to the development of related markets – carbon market-related aspects:

The main issues related to carbon markets in Africa which are relevant to the development of related markets are limitations in five main areas, namely i) regulatory framework; ii) budget; iii) relevant expertise; iv) carbon trading activities; and v) dissemination issues regarding carbon market-related guidance material. As for i) and ii), this is related to the general uncertainty regarding the future of the carbon price and of global carbon markets as a whole – most of all with respect to the future role of CERs in international offset markets. Regarding iii), this is related to a lack of general awareness as well as a widespread scarcity of relevant skillsets and knowledge of carbon financing in Africa, including the development of the key documents Project Design Documents (PDDs) and Project Identification Notes (PINs). With respect to iv), issues that hinder the development of carbon trading activities include a lack of a supporting framework (e.g. adequately skilled human resources, regime certainty, etc.). Finally, there is a lack of widespread dissemination of easily understandable information and guidance material relevant to the various types of eligible on-the-ground carbon projects.

DEVELOPMENT OF MARKETS - POTENTIAL SOLUTIONS*Potential solutions with relevance to the development of related markets – demand side aspects:*

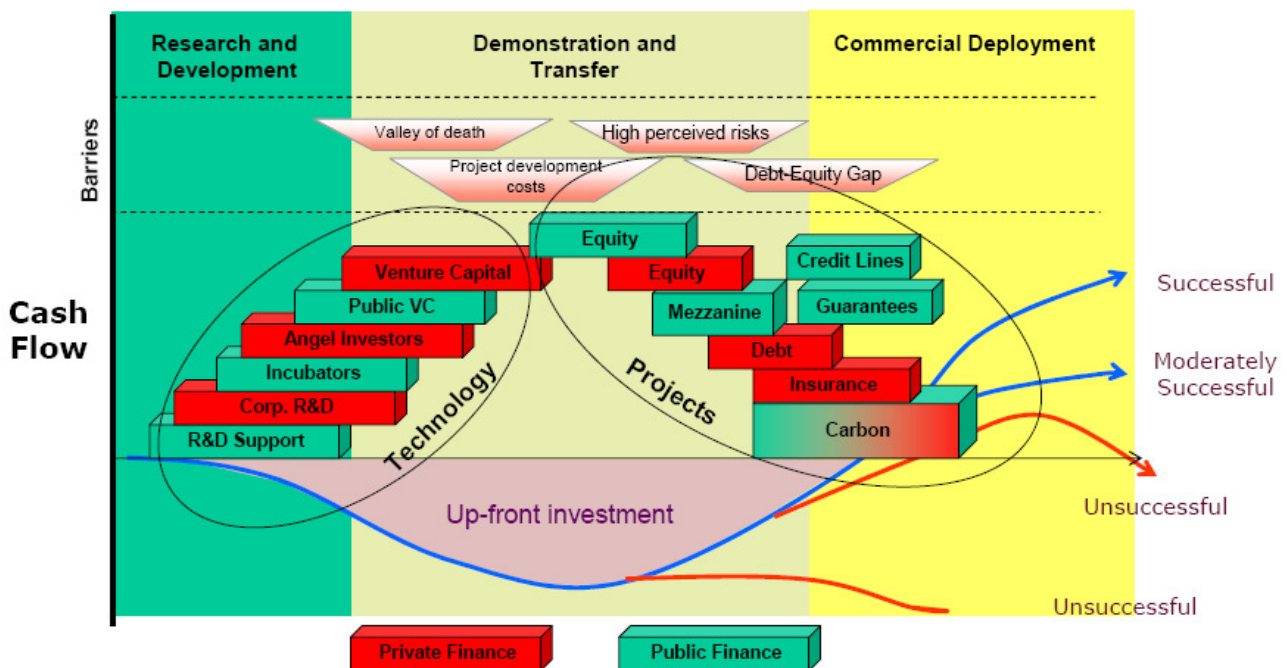
-map the bioenergy financing provider markets in Africa and to disseminate its structure (along with short descriptions and relevant contact details) to all interested parties in the bioenergy development arena (e.g. through the aforementioned 'Bioenergy One-Stop Shop' network); -counter the frequent lack of general venture development skillsets prevalent across mostly the small-scale bioenergy entrepreneurs in Africa - ideally, these services would be offered free of charge as part of for instance a separate governmental small enterprise development agency; -in order to minimise the legal costs for emerging bioenergy ventures: provision of example legal documents (in word format), for instance in the form of contract templates (online and offline) - also to be included in the service offerings of the aforementioned network of "Bioenergy One-Stop Shops", thereby responding to the current market failure of insufficient affordable legal advice for bioenergy ventures;

Potential solutions with relevance to the development of related markets – supply side aspects:

-establishing measures to counter the (perceived) shortage of available financing for bioenergy ventures, such as dissemination of potential sources of financing to project developers or extended provision of government grants / concessional loan funding; -development of a market that bundles

small bioenergy projects, at the same time resulting in diversification and improved risk mitigation, thereby increasing small projects' ability to attract financing; -less strict loan security requirements for project developers (i.e. reduction of these security requirements so that project developers have the option give up a large part (e.g. 90%) of the project initially and are able to earn back their equity in line with project progress); -improvement of awareness of existence and value of 'intermediate-stage' bioenergy developments (e.g. increased efforts to educate the financial sector regarding the existence, risks and opportunities of the markets for 'intermediate stage' bioenergy developments, i.e. that there are separate markets for pre-feasibility studies / feasibility studies / business plans); -establishment of development insurance on projects (pays out on failure), thereby facilitating project financing of bioenergy projects; -financing institutions' assessment of bioenergy investment opportunities to include TBL-related criteria, in turn forcing project developers to place more emphasis on a more sustainable implementation of their projects; -improved match of supply of and demand for financing for bioenergy ventures (e.g. development of a separate broker market, for instance as part of the scope of a(n) (online and offline) 'Bioenergy One-Stop Shop' network); -potential solutions creating investor security (e.g. a) binding national targets for the use of sustainable biofuels across Africa creating long-term demand; b) measures to prevent potential loss in value of investments in Africa (i.e. counteracting uncertainty in the economy, as well as inflation and depreciation and c) investor-supportive regulation with respect to i) reinvesting profits (i.e. profits need to be able to be reinvested outside of national boundaries) and ii) the movement of investments (i.e. investors need to be able to move their investments quickly in and out of countries)); -improving the suitability of financing instruments to the respective project development cycle (in order to i) maximise the effectiveness of the public (grant / subsidy) funding made available for bioenergy project development and ii) improve the pre-investment analysis capabilities of the private financial sector in that respect: training/knowledge dissemination for the involved private and the public sectors to improve the awareness of these issues and their solutions); The figure below illustrates a number of financing options best suited to the respective requirements at various development stages of clean energy projects:

Figure 4: Financing options at various clean energy project development stages [24]



Potential solutions with relevance to the development of related markets – other aspects:
 -improvement of land ownership-related regulation (adaptation of regulation to ensure that the development of bioenergy projects can a) support rural and social development, b) avoid the

displacement of rural population and c) encourage transparency across all stages of the development process, thereby avoiding corruption in any aspects related to land tenure); -creation of markets for bioenergy products (e.g. improvement of the cost competitiveness of biofuels through the targeted use of governmental instruments, such as taxation, subsidies or grants to reverse the price difference between fossil-fuel based fuels and biofuels in the favour of biofuels); -improved collaboration between bioenergy-related research activities and project development (e.g. establishment of piloting / demonstration projects in collaboration with academic / research institutions, for instance contributing to the establishment of best practice with respect to determining the most suitable feedstock in a given area); -strengthening of technical skillsets across bioenergy technologies (e.g. (further) development of markets that provide education and training to strengthen skills and knowledge of local manpower of bioenergy technologies); -boosting infrastructure investment to enhance market access for bioenergy outputs (e.g. infrastructure planning and investment (e.g. transmission lines, rural roads, decentralized power generation facilities) to facilitate access to the various end markets);

Potential solutions with relevance to the development of related markets – carbon market-related aspects:

-strengthening of the carbon (financing) market in Africa (e.g. i) establishment of an effective and supportive regulatory framework, ii) capacity building activities benefiting both the financing sector as well as the project development sector and iii) support to kick-start carbon trading activities in Africa); -increasing budget and experience of DNAs (i.e. thereby contributing to shortening and smoothing of the process of the provision of the letter of approval¹¹ to CDM project participants, in turn facilitating the approval and availability of carbon financing to project developers); -establishment of carbon market support facilities (e.g. improvement of existing / establishment of new carbon market support facilities by relevant (national and multi-national) market players; benefits of such facilities include for instance the engagement of (local) financial institutions and project developers to provide support with the identification, appraisal and transaction of viable carbon opportunities - a very good example in that respect is the Africa Carbon Asset Development (ACAD) Facility).

¹¹ The letter of approval confirms the contribution of a project activity to sustainable development in a country

INTRODUCTION

This work has been conducted in the framework of the project COMPETE (Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems - Africa), co-funded by the European Commission in the 6th Framework Programme – Specific Measures in Support of International Cooperation (Contract No. INCO-CT- 2006-032448).

The main purpose of this deliverable D5.4 ‘Strategy report for improving financing’ is the development of **potential solutions on how to facilitate the financing of bioenergy projects in Sub-Saharan Africa**. Four main areas are addressed that are particularly important in achieving this objective: i) **policy** (policy development enhancements); ii) **financing** (access to / supply of financing, the carbon market, etc.); iii) **trade** (options facilitating trade in the areas of infrastructure, policy and markets/economics) and iv) **markets** (i.e. the link between the financing of bioenergy ventures and any relevance to the development of related markets in Africa – taking into account demand, supply and carbon market-related aspects). In the context of this deliverable the perspectives of both, project developers as well as project financiers are taken into account.

The structure of this deliverable reflects the approach outlined above, i.e. for each of the four main sections, a general overview is presented, followed by the main issues that project developers and project financiers face. The final part of each main section then presents a number of potential solutions that can contribute to facilitating the financing of bioenergy projects in Sub-Saharan Africa.

The sources utilised to complete this deliverable have been a mix consisting of primary and secondary data compilation and analysis. Of particular relevance to this deliverable have been the results of the market survey undertaken as part of this Work Package (i.e. D5.3 ‘Survey on funding opportunities’).

1 INTRODUCTION

1.1 BACKGROUND

Biomass is by far the main source of energy in Africa, however, almost all of the biomass utilised for cooking, heating and small industrial production is in the *traditional* form, i.e. woodfuel, charcoal and residues from agricultural and industrial processes [16]. The use of *modern* bioenergy is generally restricted to where industrial residues are available on-site, such as sugar factories and timber mills. Other uses of non-traditional biomass include liquid (or sometimes gaseous) biofuels.

Despite the already very high consumption rate of biomass, Sub-Saharan Africa has the biggest bioenergy potential out of all major world regions. This is due to four main reasons, namely large areas of suitable cropland, large areas of pasture currently unused, the currently low productivity of existing agricultural production and the low labour cost. Yet, this huge bioenergy potential is currently largely untapped for a variety of reasons, with the most relevant ones being related to -lacking investor security; -insufficient access to and supply of financing; -infrastructure and technology deficits; -inadequate or lacking regulatory frameworks; -political instability and legal uncertainty; -land competition and feedstock-related issues; as well as -trade barriers and a slow rate of development of the carbon market.

1.2 POTENTIAL OF MODERN BIOENERGY FOR SUB-SAHARAN AFRICA

The development of modern bioenergy systems offers significant opportunities for Sub-Saharan Africa to improve the currently low yield subsistence farming-dominated agricultural sector, most of all with regard to energy, socio-economic and environmental aspects. This not only represents a promising means to increasing Africa's access to energy and to reducing global carbon emissions in an efficient way, but it most of all presents opportunities for African countries to attract associated investment and technology flows.

However, despite the evident potential of bioenergy -including biofuels- in Africa, these kinds of ventures have been facing a number of complexities across the entire value chain, mostly related to policy development, supply chain (including feedstocks and infrastructure), land competition, trade, market development and in particular with respect to access to and supply of financing.

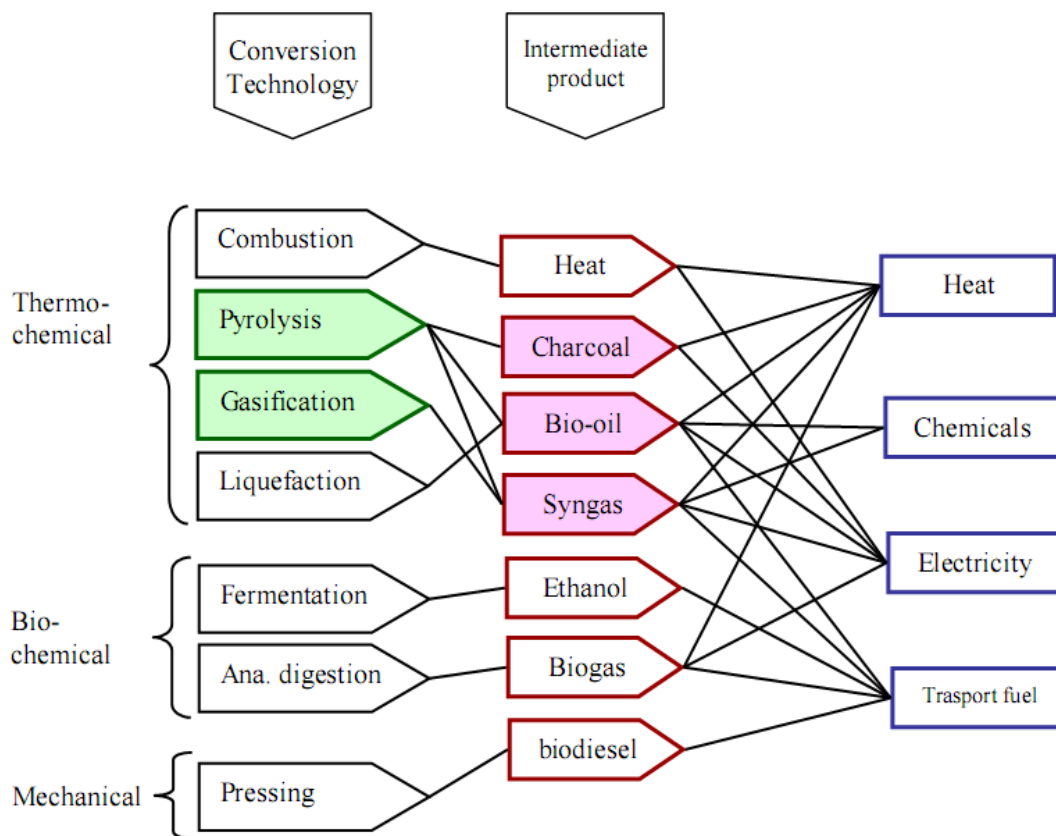
An increased investment in modern bioenergy projects in Sub-Saharan Africa would result in improvements with respect to

- access to energy
- investment and infrastructure improvements in agriculture and transport
- diversification of agricultural production
- increase in business, income generation and employment, thereby contributing to poverty reduction
- food and energy security
- decrease in environmental issues resulting from the growing transport sector
- sustainable management and use of natural resources
- optimisation of intra- and inter-governmental policy development.

In terms of the various options to convert biomass into useful commodities, this is illustrated in the figure below. Three relevant examples in this context include i) fermentation of cellulosic biomass to ethanol, which is a suitable method for sustainable large-scale ethanol production given that it does not compete with food production (in contrast to grain-based ethanol); ii) biogas production

through anaerobic digestion, which is a low-cost, simple technology but quite slow and not the best option for cellulosic biomass; and iii) mechanical conversion (pressing) of oily seeds, such as rape and jatropha seeds, which produces bio-diesel.

Figure 5: Principal bio-energy conversion routes and high-value products



Source: UNDP-UNEP (2009, with modifications)

Another useful diagram in this context is displayed below illustrating the various types of liquid fuels from biomass, their respective sources, benefits and market maturity.

Table 1: Liquid fuels from biomass

Fuel	Source	Benefits	Maturity
Grain/Sugar ethanol	Corn, sorghum, wheat, sugarcane	- High-octane fuel for gasoline blends - Widely available renewable sources	Commercially proven
Bio-diesel	Vegetable oils, fats, greases	- Reduces emissions - Increases diesel fuel lubricity	Commercially proven
Green diesel and gasoline	Organic oils and fats, blended with crude oil	- Superior feedstock for refineries - Low-sulphur fuels	Commercial trials in Europe and Brazil
Cellulosic ethanol	Grasses, wood chips, agricultural residues	- High-octane fuel for gasoline blends - Probably only viable scenario for sustainable ethanol production	Demo-plant in Sweden, commercial demonstration in US by 2012
Butanol	Corn, sorghum, wheat, sugarcane	- Low volatility, high energy-density, water-tolerant alternative fuel	Commercially planned by BP & DuPont
Pyrolysis bio-oil	Any lignocellulosic biomass	- Refinery feedstocks, fuel oils, a future source of aromatics and phenols	Several commercial facilities for energy & chemicals
Syngas liquids	Various biomass & organic waste	- Can integrate biomass sources with fossil fuel sources - High-quality synthetic liquid fuels	Demonstrated on a large scale with fossil fuels, commercial biomass projects under construction
Diesel/Jet fuel from Algae	Microalgae grown in agricultural systems	- High yield per hectare, an aquaculture source of biofuels - Can be employed for CO2 capture	Demonstrated at pilot scale in 1990s
Hydrocarbons from Biomass	Biomass carbohydrates	- Synthetic gasoline, diesel and petroleum products	Laboratory-scale academic research



Source: NREL (2008)

1.3 SPECIFIC CHARACTERISTICS OF BIOENERGY PROJECTS AND VENTURES

Every commercial venture requires close consideration of the underlying specific characteristics and its risks and opportunities. The specific nature of bioenergy ventures (e.g. in comparison to other types of renewable energy projects) is multi-faceted and includes:

- *Reliance on feedstock*: bioenergy is the only type of renewable energy whose feedstock is not freely available (i.e. in contrast to wind, solar, hydro, marine, geothermal, etc. energy). The implications of this situation result in a strong reliance of the viability of a bioenergy venture on the reliable and long-term supply of the underlying feedstock. This, in turn, highlights the requirement of legal expertise in order to put in place a contractual framework that contributes to securing the aforementioned reliable and long-term supply of the respective feedstock.
- *Bioenergy market complexity*: given the issues around biomass feedstocks -which in turn have important socio-economic implications, such as the food versus fuel debate-, the bioenergy market is more complex and involves a greater number of stakeholders than comparable markets of other types of renewable energy.
- *Bioenergy market structure*: the market structure for bioenergy is more diverse than that of other types of renewable energies. It ranges on the supply side from small start up ventures to major international corporations in the case of biofuel production and on the consumer side from household-level consumers (charcoal) to transport fuel consumers across the world (biofuels).
- *Unpredictability of bioenergy projects' output*: the output of renewable energy projects is generally difficult to predict, provided that most renewable energy technologies are of an intermittent nature (a few exceptions apply, such as geothermal or tidal energy). This is even more so the case with bioenergy projects, given that the feedstock supply very much depends on harvesting yield, which are generally unpredictable.
- *Food versus fuel debate*: biofuels are arguably the only type of renewable energy whose production can have a negative impact on the food security of a country – due to the argument that it could divert crops (e.g. corn, sugar cane), farmland and other resources (water, fertilisers, labour, etc) away from food production, thereby potentially causing food price increases and even food shortages.
- *Perceived risk profile of bioenergy project/ventures*: in comparison to the more established renewable energy technologies such as solar, wind or hydro, bioenergy is perceived more risky by the market place, most of all, however, by the financing sector. This results in the application of a higher risk profile, thereby directly translating into stricter requirements in terms of collateral (e.g. collateral required to cover entire loan amount) and/or lending terms (e.g. interest rates, payback period) for the provision of financing for bioenergy projects, in turn making it very challenging for project developers to access external funding from the financial sector.
- *Increased importance of policy framework*: even though the viability of virtually all types of renewable energy technologies is dependent on an effective policy framework being in place (which in turn is due to the lacking cost competitiveness with fossil-fuel based energy), thereby creating the required demand structure planning horizon, bioenergy is arguably even more dependent on an effective policy framework structure than other types of renewable energy. This is due to the potential implications of e.g. biofuel production on issues such as land competition, resource competition and/or food security – all three of which are important socio-economic criteria for every country.

2 POLICY DEVELOPMENT

This section covers three areas relevant to demonstrating options how policy development can be enhanced in order to facilitate the financing of bioenergy ventures in Africa, i.e. it includes a general overview of bioenergy-related policy development aspects (in sub-section 2.1.1), the issues at hand (in sub-section 2.1.2) and potential solutions (in sub-section 2.2).

2.1 OVERVIEW AND ISSUES

2.1.1 OVERVIEW

Despite significant improvements over the last years in terms of the cost per produced unit of energy, renewable energy technologies still struggle to be competitive with the most common fossil fuel-based energy generation technologies. Given that only continued innovation and the large-scale deployment of renewable energies will result in economies of scale that will eventually translate into a cost at or below the retail rate of the fossil-fuel based transport fuels / grid power, it is crucial to create a framework that supports the creation of a market for renewable energies – especially at this stage, i.e. as long as the parity with transport fuel prices / grid electricity prices has not been achieved yet.

This highlights the importance of a supporting policy framework for the development of renewable energy projects - and for bioenergy projects in particular. The clear positive correlation between these two aspects therefore has a direct impact on both the financial viability of bioenergy projects as well as on investor security.

2.1.2 ISSUES

This sub-section covers the *issues* around bioenergy-related policy development in Africa – from both, project developers', as well as project investors' points of view. In particular, the issues presented cover four areas, i.e. i) 'competition of bioenergy with other areas'; ii) 'issues with a direct impact on investors'; iii) 'other aspects' and iv) '1st and 2nd generation biofuels'.

Competition of bioenergy with other areas:

- Security of food supply / land competition: in some cases, bioenergy crops and food crops compete for the same land area (to guarantee low-cost, available feedstock supply);
- Resource competition: many bioenergy feedstocks have alternative uses in addition to bioenergy, thereby creating a two-sided price competition: low bioenergy prices are needed to compete with fossil fuels, while high prices are needed to secure feedstock in a competitive market;
- Opposition (both active and passive) of major energy suppliers / petroleum industry and equipment manufacturers to bioenergy development; this can slow the pace of bioenergy development;

Issues with a direct impact on investors:

One of the issues with a direct impact on investors is political and regulatory risks. Investors are wary of investing in projects which rely on government policy/subsidy to give a favourable return on investment. This is particularly the case as some governments have made u-turns in the past regarding their renewable energy-related policies.

Another challenge investors face is related to regulations affecting the movements of investments. In particular, investors need to be able to move their investments quickly in and out of a country.

Further issues in that area are investor-supportive policies with respect to reinvesting profits. In some countries, profits cannot be re-invested outside the national boundaries, thereby clearly undermining the attractiveness of those countries to investors.

Other aspects:

- Lacking on-the-ground understanding / consumer awareness about bio-energy benefits;
- Role that bioenergy technologies can play in meeting non-energy goals (such as waste management);
- Adequate demand: bio-energy projects have a good chance of failing if the primary demand for heat and power are low load capacities (e.g. lighting / cooking); therefore, there are higher chances of success for heat / power applications, such as water pumps, small-scale manufacture / industry and other electricity / shaft uses;
- Unsited sites: due to the low rainfall in most parts of Sub-Saharan Africa (SSA), some of the most important bioenergy crops, i.e. sugarcane and palm oil, are largely unsuitable for SSA. Despite an overall low productivity agriculture, the situation looks better for soy and jatropha in Africa;
- Management capacity: poor construction, incorrect operation, inadequate maintenance, poorly designed dissemination programmes, inadequate monitoring and low ownership responsibility are common;

1st and 2nd generation biofuels:

The issues around 1st and 2nd generation biofuels are a good example of how technology and policy developments directly affect related investment decisions.

In a nutshell, the difference between these two types of biofuels is that 2nd generation biofuels (which are still at a research, development and demonstration stage) only use either non-food crops or the residues (such as stems or leaves) of food crops as feedstock¹², whereas the feedstock utilised for the currently produced 1st generation biodiesel and bio-ethanol, i.e. mostly grains and seeds (for biodiesel) or plant-derived sugar and wheat (for bio-ethanol) could also enter the animal or human food chain.

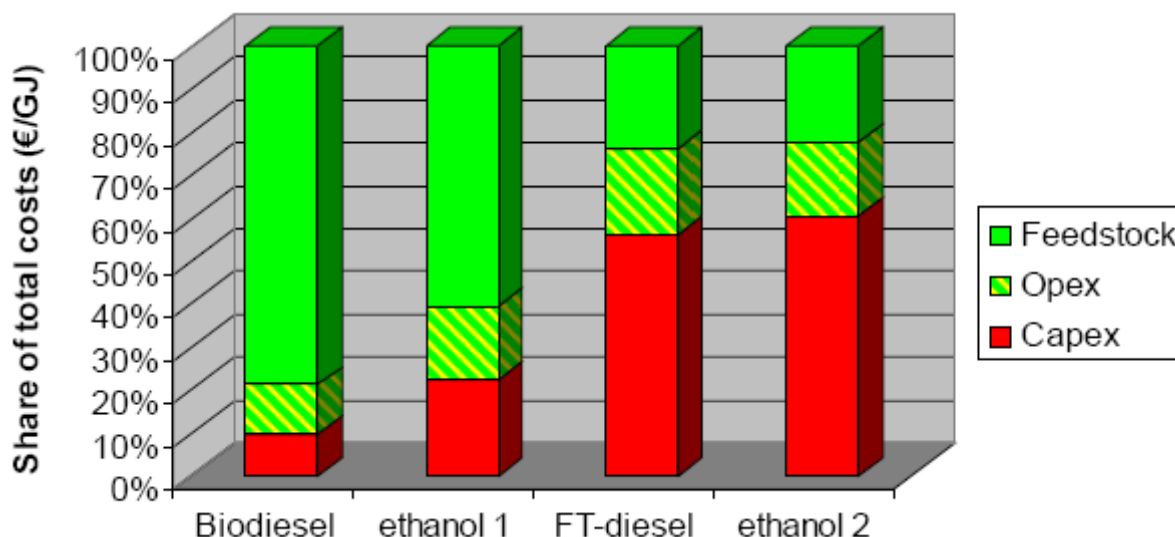
Due to issues around feedstock sustainability / food versus fuel discussions, current biofuel market immaturity, investor security and relevant policy frameworks, the future market development of biofuels is very uncertain. Therefore, current estimates of the first market entrance of 2nd generation biofuels are based on assumptions and range between 2011 and 2020 with the main parameter influencing the future share of 2nd generation biofuels being the policy conditions to incentivise the development of and investment in 2nd generation technologies.

The two main aspects in this context that have a direct impact on investment flows into biofuels are related to i) the required investments in R&D -mainly in the development of conversion technologies- and ii) the capital expenditure (capex) required for the conversion installations. The current state of affairs in this context is that average investment costs for 2nd generation biofuels will be significantly higher than those for 1st generation biofuels - estimates range from an increase by a factor of 4 (per unit energy produced) up to a factor of 8.5 (per unit GHG mitigation).

¹² The second generation alternative for biodiesel would come from Fischer-Tropsch diesel (FT-diesel) and for bio-ethanol from ethanol produced from lingo-cellulosic feedstock, or methanol and hydrogen from lignocellulosic feedstock.

Figure 6 below illustrates this graphically – demonstrating that the share of capital expenditure in the total production costs of biofuels is expected to increase from a current level of 10-20% to a level of between 50-60% for 2nd generation biofuels – with the relative costs of feedstock reducing accordingly.

Figure 6: Relative shares of feedstock costs, operational expenditures (Opex) and capital expenditures (Capex) in total biofuel cost price for different biofuels [3]



As a result, the risk profiles will shift from a current susceptibility to changes in commodity prices for 1st generation biofuels to uncertainty related to investment costs for 2nd generation biofuels. The consequence of this shift in risk profiles is that 2nd generation biofuel plants will be much less flexible in responding to poor market conditions, i.e. these new and capital intensive plants will need to operate even in times of unfavourable commodity prices. In contrast to that, 1st generation biofuel plants have the option to reduce output -even up to the point of temporary shutdown- without too high remaining capital costs.

2.2 POTENTIAL SOLUTIONS

Having covered the *issues* around bioenergy-related policy development in Africa, this sub-section now presents *potential solutions* which can contribute to facilitating the financing of bioenergy projects on the continent.

Regarding the structure of this sub-section, three main categories are covered, i.e. i) 'potential solutions around (direct) government policy support', ii) 'potential solutions around 1st and 2nd generation biofuels' and iii) 'potential solutions around other areas'.

Potential solutions around (direct) government policy support

There are a number of ways through which governments can remove regulatory risk, i.e. offer policy support supportive of bioenergy projects/ventures, including:

- *Blending requirements*, i.e. a nationally-mandated blend of ethanol in gasoline / biodiesel in diesel as a financial incentive to create a guaranteed market for bioenergy producers, and thereby lower investment risk and cost;

- *Tender schemes* to guarantee markets for bioenergy while promoting competition and efficiency;
- *Realistic goals* (% , mtoe, etc.) *and strategies* (food, fuel and fodder needs);
- *Financial incentives*: i) that either increase the price of competing energy sources, or reduce the cost of bioenergy supply, ii) such as tax holidays and waivers on import duty on imported components for the implementation of bioenergy projects;
- *Power purchase agreements (PPAs) / Feed-in tariffs (FITs)*, i.e. a guaranteed price over a predetermined length of time to bioenergy producers selling electricity into the grid; this encourages bioenergy and supports project developers in raising investment finance;
- *Government-enacted renewable energy portfolio protocol* obliging industries / large energy companies to utilise a minimum proportion of total energy from renewable sources including bioenergy – ideally, from small-scale producers
- *Differential taxation*: either increasing the price (taxes) of competing energy sources (fossil fuels) and/or reduced taxes on bioenergy to encourage the uptake of bioenergy - particularly useful for the financing of early stage bioenergy project development;
- *Direct government subsidies / low interest grants* to kick-start bioenergy projects;
- *Green certification*, i.e. the practice of requiring consumers to purchase a certain portion of their power supply from certified green sources. This provides a guaranteed market for bioenergy and promotes an auditing programme encouraging efficiency from bioenergy-generating entities;
- Integration of renewable energy (including bioenergy) financing into the *energy budget*;
- *Legal framework* that stimulates the development of Independent Power Producers (IPPs) and provides visibility for contractual agreements –PPAs; overall a predictable legal framework;
- Support to advance *research, development and demonstration* (RD&D) of bioenergy (e.g. 2nd generation biofuels) – required to cover high costs of developing new technologies;
- *Government support to establish good practice*: A good example of successful biodiesel project implementation in Africa is the establishment of Multi-Functional Platforms (MFPs) in Tanzania. MFPs combine a biodiesel engine (driving a press for producing *Jatropha* oils), a generator (for electricity production) and a mill (to grind cereal) or a compressor (for inflating tyres). MFPs are run on a commercial basis (by an entrepreneur selected by local villagers) with revenue coming from the collection of connection/service and maintenance fees;
- *Government support for project developers in choosing the most suitable bioenergy crops*: In order to prevent unexperienced project developers from growing suboptimal bioenergy crops, the government should initiate, finance and disseminate RD&D activities to determine the most promising bioenergy crops for the respective local and regional soil and weather conditions;
- *Government support for project developers to optimise bioenergy project/venture-related management capacity*: It would be beneficial for project developers, if there were government-supported capacity building programmes to optimise entrepreneurial / project development -possibly through a (mandatory) project development certification scheme-, i.e. successful planning, construction, operation, monitoring and maintenance of bioenergy developments;
- *Overall objective: development and enforcement* (!) of consistent and clear policies and market conditions;

Potential solutions around 1st and 2nd generation biofuels

Following on from the ‘issues around 1st and 2nd generation biofuels’ presented earlier on in this section, the main issues that need to be resolved in this context are related to the interrelationship between investment decisions into current 1st generation and future 2nd generation biofuels and to what extent policy support can potentially help resolve this issue.

The central aspects in this regard are therefore whether there will be a long-term market share for biofuels, and to what extent investments in 1st generation biofuels may introduce a lock-in effect hampering the introduction of 2nd generation biofuels.

As for the expected role of biofuels in future transport sectors, studies conducted predict a long-term sustaining role for biofuels, particularly in sectors such as aviation and long-distance heavy road transport, for which the alternative technologies (such as the hybrid, the all-electric vehicle and the hydrogen-fuelled fuel cell vehicle) are not suitable. Therefore, kerosene and diesel producing biofuel technologies, such as the FT process, are expected to maintain a position in the market in the long run, even in the (uncertain) case of a strong take-off of the electric / fuel cell vehicle. Nevertheless, it will be important to support the creation of a stable demand for biofuels. For that purpose, the development and enforcement of consistent and clear policies and market conditions -including aspects such as blending regimes, biofuel standards or increased taxation on fossil fuels- are areas where policy support can be a very effective tool. The development of sustained, long-term market demand will in turn significantly improve the prospects of future bioenergy ventures/projects in Africa attracting sufficient investment – not just in terms of short-term investments in 1st generation biofuel technologies, but also with respect to long-term investments in the future, more capital-intensive 2nd generation technologies, thereby also avoid any potential ‘food versus fuel’ issues.

Regarding the question whether 1st generation biofuels will hamper the introduction of 2nd generation biofuels, it is important to differentiate between ethanol and biodiesel production. 1st generation ethanol production facilities can be retrofitted into 2nd generation facilities and can in fact be used as a step-up to 2nd generation production. The same, however, does not apply to biodiesel where investment in 1st generation biodiesel may become a barrier for 2nd generation production due to the lacking technology link between the two generations.

Potential solutions around other aspects

Aside from the above-mentioned potential solutions around (direct) government policy support and 1st and 2nd generation biofuels (see below), there are a number of potential solutions around aspects not falling in either of these two categories, including:

- Setting up of *pilot and demonstration projects* to prove the feasibility and viability of various bioenergy technologies / bioenergy project types (e.g. outgrower model);
- Cross-national efforts to establish and nurture *knowledge sharing* activities between all relevant bioenergy market players;
- Improved *collaboration* between research and bioenergy project developers;
- *Removal of multi tiered paperwork / bureaucracy / simplification of procedures* of all procedures relevant to the development of bioenergy projects/ventures;
- Development of policies that clarify all aspects around *securing land tenure*;
- National strategy for coordination of *bioenergy-related research programmes*;
- Development of *national database / maps* to ensure project developers and investors are aware of areas with adequate demand, thereby avoiding investment in projects where the

primary demand for heat and power are low load capacities (e.g. lighting / cooking); instead, heat / power applications, such as water pumps, small-scale manufacture / industry and other electricity / shaft uses are preferred to secure adequate demand for bioenergy-generated energy;

- Policy support to facilitate *joint ventures* between international financing organisations, governments and private companies;
- In order to improve consumer awareness about bio-energy benefits: launch of *bioenergy promotion campaigns*;
- *Governmental loan guarantee programs* to support the development, construction and -where applicable- retrofitting of innovative bioenergy plants, including biorefineries or more generally, conversion technologies for 2nd generation biofuels;
- Policy support regarding *cost of capital* in Africa (i.e. counteracting uncertainty in the economy, fighting inflation and depreciation) with the aim of preventing loss of the value of investment

3 FINANCING

This section presents the relevant aspects around bioenergy project / venture financing in Africa. In particular, three areas are covered, i.e. a general overview of bioenergy-related financing aspects (in sub-section 3.1.1), the issues at hand (in sub-section 3.1.2) and possible solutions (in sub-section 3.2).

3.1 OVERVIEW AND ISSUES

3.1.1 OVERVIEW

One of the key challenges that bioenergy project developers in Africa face is securing financing for the various stages of their ventures. This includes i) at risk development funds to develop the initial business idea into a venture, ii) development funding to bring in and do work on projects and iii) long-term equity / long-term debt and working capital (e.g. for salaries and equipment).

Of particular difficulty for project developers in this context is to raise money for the early-stage development of their business, i.e. business idea, pre-feasibility and feasibility. Given that the bioenergy market in Africa is a young and high risk market -in turn making it difficult to attract financiers' interest and/or their investment comes at a high price for project developers-, most of the sources of the funds for early-stage bioenergy project development are either own equity, forward sales of project outputs or at risk funding in exchange for large equity share (i.e. project owners lose control over their business). Therefore, one of the lessons learned by developers of (small-scale) bioenergy projects in Africa¹³ is that the further into the project development cycle the business develops (i.e. post feasibility), the easier it is to get access to external funding.

In order to facilitate the financing of bioenergy projects in Africa, a number of issues and potential solutions around 'access to / supply of financing', 'the carbon market' and 'other areas' will be discussed in this section – ranging from issues resulting from the (strict) requirements set by the financial sector that bioenergy businesses need to fulfil to unlock investment right through to potential solutions regarding the necessity to create a supporting framework for the currently emerging carbon trading-related activities in Africa.

3.1.2 ISSUES

This sub-section covers the *issues* around financing of African bioenergy ventures and projects – from both, project developers', as well as project investors' points of view. The issues presented in this sub-section are related to a) the wider area of 'access to / supply of financing' and b) 'the carbon market'.

Issues around access to / supply of financing

One of the biggest, if not *the* biggest challenge that bioenergy project developers in Africa face is access to financing of their projects and ventures. Common issues in this context are related to

- *The nature of bioenergy projects in general*, such as uncertainties and risks regarding technology and feedstock or land ownership of the project;

¹³ Resulting from primary market research undertaken as part of this work package, i.e. D5.3 'Survey on funding opportunities'

- *Requirements set by the financing sector*, e.g. i) strict demonstration of financial and technical feasibility of project/venture as part of a bankable business plan / technical feasibility; ii) (additional) collateral required; iii) all risks to be underwritten, including offtake agreement, technology, feedstock, etc.; iv) increasingly higher interest rate margins and fees; v) developers' track record and technical expertise; vi) acceptance of carbon financing as collateral requires a Project Design Document (PDD) or at least a Project Identification Note (PIN);
- *Current state of financing sector*, for instance i) generally across African countries, a very limited amount of funds is available for (perceived) high risk financing, such as bioenergy projects/ventures; ii) lack of in-house expertise within financial institutions regarding bioenergy project evaluation resulting in having to buy-in this expertise – the increased costs are eventually being added to the overall financing costs for the project; iii) long application and approval procedures of bioenergy financing requests which tend to discourage potential project developers;
- *Current state of bioenergy project development industry*, i.e. lacking in-house expertise to look for funds, prepare bankable pre-feasibility and feasibility studies, and negotiate with lenders to obtain the most favourable financing terms – particularly applicable to small to medium-sized project developers;
- *Financial strength of small- to medium-sized bioenergy project developers*: e.g. lack of untied assets and/or lack of financial strength to provide or mobilise guarantee instruments in lieu of asset-based collateral;
- *Project / venture size*, for instance i) the struggle of small/medium projects / ventures to attract interest from financial institutions due to similar requirements in terms of transaction costs / due diligence than for big(ger) projects; ii) wherever a number of smaller projects are combined to a single large investment, this results in massive co-ordination requirements (aggregation challenge);
- *Project / venture type*, for example the inexperience in the market with some of the bioenergy business models, such as the Out Grower Model (OGM);
- *Project / venture viability*, i.e. in the vast majority of the cases, cheaper energy and by-product alternatives exist which in turn has severe implications on a) the financial feasibility of the investment and b) the possibility of a realistic return to investors;
- *Perceived risk profile of bioenergy projects / ventures*, i.e. the perceived risk profile of bioenergy investments is high in comparison to alternatives which in turn means that they lose priority in large scale lending markets;
- *Availability and dissemination of bioenergy-relevant information for all financing stakeholders*: limited information is available on the bioenergy industry to guide investors and financiers in making sound decisions in bioenergy project developments; on the project developers' side, this includes e.g. a lack of standard Power Purchase Agreement (PPA) documentation (as first level support in the lengthy and complex PPA negotiations);

Issues around other areas

- *Early-stage bioenergy project financing issues*, i.e. i) the vast majority of the sources of the funds for early-stage bioenergy project development are either based on own equity, on forward sales of project outputs or on at risk funding in exchange for large equity share; ii) the further into the project development cycle -i.e. once feasibility has been proven (i.e. bankable feasibility study / business plan)-, the less risky the perception of such ventures which in turn increases the availability of external funding;
- *Project/venture ownership issues*, e.g. project developers need the option to retain control over their businesses, making it more difficult for developers to accept capital from sources requiring a large equity share in return for a loan;

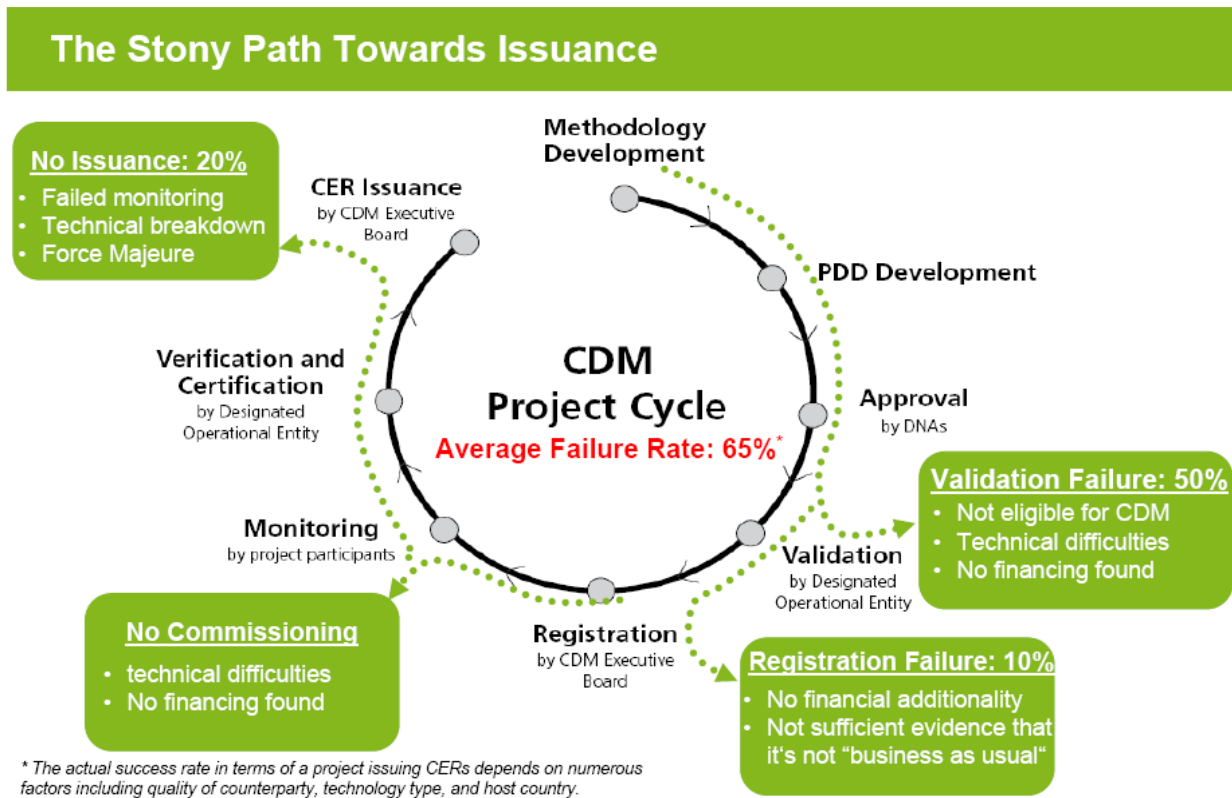
- *Infrastructural issues*, i.e. low electricity access and metering conditions across most African countries, impeding the use of incentives to promote bioenergy, such as feed-in-tariffs (in turn funded by differentiated taxes and user fees);

Issues around the carbon market

The international compliance and voluntary carbon markets have grown strongly over the last years; however, there are a number of issues experienced by all carbon market stakeholders, including project developers and project investors which also have implications on the carbon market-related prospects of bioenergy projects in Africa. This includes a number of related barriers and risks, including i) inexperience with and uncertainty about the global carbon markets - especially related to the continued existence of the Clean Development Mechanism (CDM) (or an equivalent succession scheme) beyond 2012 and the resulting uncertainties regarding the future role of CERs in international offset markets; ii) the general complexity of the carbon markets; iii) widespread inadequate on-the-ground carbon market-related capacity and expertise; iv) high and even increasing transaction costs (applicable to all types of projects, but particularly negative for small-scale carbon projects); v) a smaller (and decreasing) number of large-scale carbon project opportunities; and vi) other, more project specific issues, including host country risks (financial & regulatory), additionality issues (at validation stage) or underperformance due to faulty monitoring / delays in issuances (CDM related or construction related) (at issuance stage). All of these issues undermine investor confidence regarding carbon finance revenues / the future carbon price and therefore the future of the compliance and voluntary carbon markets as a whole.

Aside from the issues mentioned above, the graph below illustrates a more general overview of possible failures along the CDM project cycle, including validation, registration, commissioning and issuance failures. Overall, the average failure rate is 65%!

Figure 7: Risks along the CDM project cycle [11]



As already illustrated by the above graph, risks in the development of CDM projects decrease with overall project development, i.e. the more advanced a project is in the CDM project cycle, the lower (generally) the risk of failure. This trend is confirmed by the graph below, which also demonstrates the negative correlation between CDM project cycle progress and failure risk.

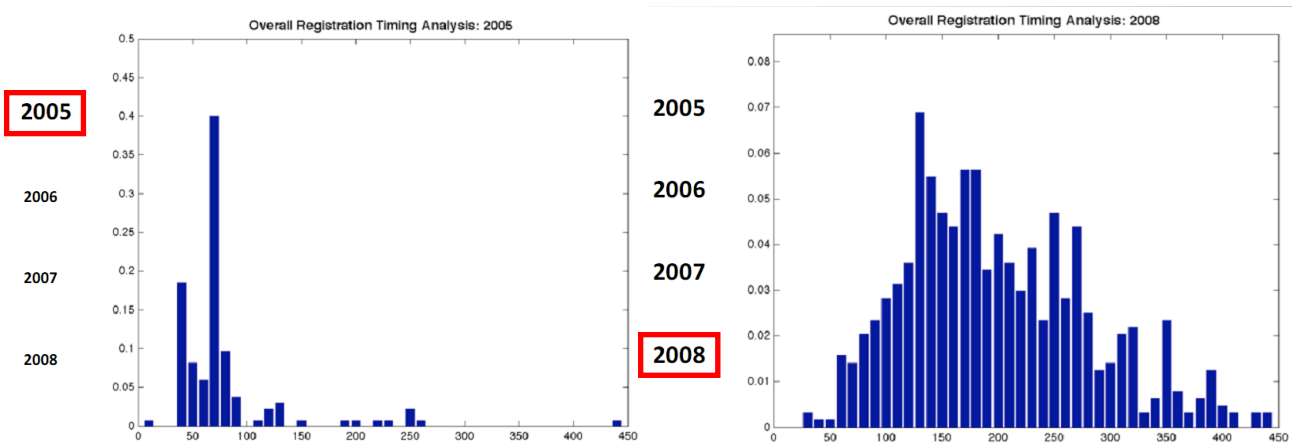
Figure 8: CDM project risks – development over project cycle [11]

CDM		PA start	Validation	Registration	Issuance
Project	Financial close	Purchase	Construction	Commissioning	Working mode
Failure					
Perform					
Delay					

Another aspect demonstrating the issues around investor confidence in the carbon markets is related to registration delays. In the example of the CDM, registration delays have increased significantly over the last years. The two graphs below illustrate that trend – in 2005, the majority of the registration delays of CDM projects was between 40 and 100 days (with a maximum delay of

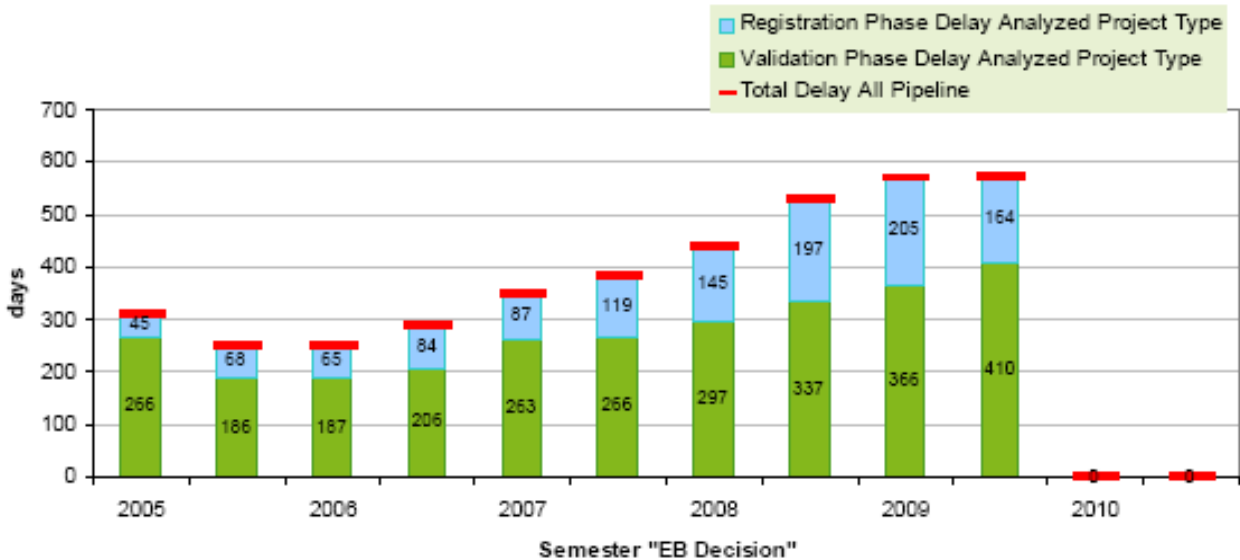
around 250 days), whereas the trend in 2008 showed that this range not only widened to up to a maximum of 450 days, but that the most common delays increased to between 130 and 270 days.

Figure 9: CDM project risks – registration delays in 2005 and 2008 [21]



An even bigger hindrance in the CDM project cycle (in terms of actual average project delay) than hold-ups due to registration waiting times, however, are delays caused during the validation process. The graph below confirms that – illustrating that the average delay during the validation phase has increased by 230 days between 2006 and 2009, whereas the average registration delay has only gone up by around 140 days during the same period.

Figure 10: CDM pipeline – timeline for registration and validation (average) [11]



As for the main reasons of the validation and registration delays, these are related to stricter guidelines in terms of proof of additionality being applied by the Executive Board (EB)¹⁴. This has resulted in a larger number of projects requiring a review, in turn leading to an increasing CDM project pipeline. In combination with an overall increasing number of projects entering the CDM

¹⁴ The CDM EB is responsible for the approval of CDM projects and for the issuance of carbon credits for these types of projects

project cycle and a concurrent lack of capacity on both, the EB, as well as the Designated Operational Entities (DOE¹⁵) sides, these are the main reasons for the significant increase in delays to get projects through the CDM project cycle.

Having demonstrated the issues around the carbon market, it needs to be highlighted, though, that even though the CDM has contributed to the financial viability of numerous types of clean energy projects across the globe, Africa has only benefited marginally from CDM revenues. In actual numbers, less than 2 per cent of all registered CDM projects are located on the continent¹⁶ and over 1/3 of them are registered in just one African country, i.e. South Africa¹⁷. Globally, China dominates the CDM market with a share of close to 40 per cent of all registered projects, followed by India with around 22 per cent¹⁶.

Finally, the contribution of revenues from carbon credits to the overall cost of bioenergy projects in Africa varies between 2% and 25%¹⁸ (depending most of all on the project type), so while carbon credits can contribute to making bioenergy projects financially viable, other aspects of project / venture financing are far more important.

3.2 POTENTIAL SOLUTIONS

Having covered the *issues* around bioenergy project/venture financing, this sub-section now presents *potential solutions* which can contribute to facilitating the financing of bioenergy projects in Africa. As with all other parts of this report, too, this sub-section also puts forward aspects from both, project developers' as well as project investors' perspectives.

Regarding the structure of this sub-section, three main categories are covered, i.e. i) 'potential solutions around access to / supply of financing', ii) 'potential solutions around other areas' and iii) 'potential solutions around the carbon market'.

Potential solutions around access to / supply of financing:

The aspects put forward in this sub-section are related to four main categories, i.e. 'market intelligence', 'financing sector – requirements and supply of funds', 'renewable energy investment facilities' and 'capacity building'.

Market intelligence:

Project developers are usually not aware of the full range of market players active in providing financing for bioenergy projects/ventures. It would therefore be beneficial to create, maintain and make available (online and offline) a comprehensive database of potential financiers/investors that are active in the bioenergy markets in Africa. Such a database would include various financial market players, including commercial banks, angels and venture capitalists, equity funds, donors, providers of grants and concessionary loans (such as AREED), energy finance houses (for example E+Co), bi-lateral / multi-lateral funding sources (including World Bank, UNDP, EnDev

¹⁵ DOEs are independent, EB accredited auditors whose role is to assess whether a potential project meets all the eligibility requirements of the CDM (validation), and whether an actual reduction in greenhouse gases has been achieved (verification and certification) (source: CDM rule book)

¹⁶ Source: <http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByRegionPieChart.html>; African share of registered CDM projects: 45 out of 2,338 projects (as of August 2010)

¹⁷ 17 out of 45 African CDM projects (as of August 2010), source:

<http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>

¹⁸ Figures based on primary market research undertaken as part of this project

project, ESMAP, etc), regional development banks (e.g. AfDB), business partners, private parties, etc.

The database should be built on and linked to existing documentation providing potential sources of financing, such as the Global Bioenergy Partnership's (GBEP) 'Financing options for bioenergy projects and programmes' which is available in both report form [13], as well as on the GBEP's website¹⁹ providing an up-to-date online version of the report.

Financing sector – requirements and supply of funds:

From the bioenergy project developers' perspective, there are a number of aspects that the financing sector should consider to improve in order to facilitate access to financing of bioenergy projects/ventures – currently mostly caused by very limited availability and very high cost of financing of funds for bioenergy projects; this includes

- Shortening and simplification of application and approval procedures for financing;
- Review -and where possible easing- of the currently strict conditions attached to the supply of finance for bioenergy ventures/projects;
- Consideration of non-financial criteria, as well (e.g. triple-bottom-line) for financing request evaluations;
- Lowering of (mostly high) interest rates (e.g. 35% - 37% interest rates in Ghana, if USD denominated loans: 7-10%);
- Provision of more speculative and up front bioenergy-related funding – secured through diversification and risk mitigation across multiple projects, thereby reducing risk;
- Reduction of security requirements providing project developers with the option to give up a large share (e.g. 90%) of the project initially – with the possibility to earn back as the project development proceeds (e.g. based on project stage and developer funds);
- Development of / provision of insurance products to mitigate certain types of bioenergy-related risks;
- Development of venture capital industry is needed;
- Offering of short term development loans (covered by the above, but not to cover premiums);
- Microcredit, especially in small scale bioenergy projects, can be used as a financing template;
- Review of the financing sector's bioenergy business evaluation models with respect to two aspects: i) supply of financing needs to include both, early-stage (e.g. at risk speculative development funds to take projects from idea to project), as well as business expansion funding (long-term equity / long-term debt) and ii) bioenergy project equity can also be sold on at an 'intermediate' stage (e.g. after business plan development) - this is facilitated through the existence of separate markets for pre-feasibility studies / business plan / feasibility studies of bioenergy projects.

Renewable energy investment facilities:

In order to enable promoters to access low interest capital to cover sufficient equity contribution for their bioenergy businesses, it would be beneficial to establish special purpose national/regional renewable energy funds/investment facilities with major financial institutions. Contributions to these pooled funds/investment facilities could also come from donor money for renewable projects. Other potential uses of these funds could be to support the introduction of guaranteed energy tariffs (similar to the concept of feed-in-tariffs, i.e. annually decreasing tariffs).

¹⁹ www.globalbioenergy.org

Capacity building:

Given the complexity of the bioenergy market, it would be very beneficial to train up market players in the financing sector to improve the sector's understanding regarding bioenergy, for instance in terms of knowledge of bioenergy technologies, risk assessment, etc. with the objective to enhance the market's understanding of the opportunities and risks of investments in bioenergy projects/ventures.

Potential solutions around other areas:

This subsection offers potential solutions around other areas, i.e. areas not covered by the other parts of section 3.2, i.e. i) access to / supply of financing and ii) the carbon market. In particular, these are 'other types of bioenergy enterprise development support', 'one-stop shop for bioenergy project developers and project investors', 'trade of bioenergy products', 'national support measures' and 'good practice examples in African countries'.

Other types of bioenergy enterprise development support:

Apart from support related to *accessing* bioenergy project/venture financing (as covered in the last section), there are a number of other types of support useful for project developers in terms of building up and strengthening their businesses -in turn maximising developers' prospects to access and attract funding for their ventures-, including:

- 'Standard' spreadsheet models to cover major project types and calculate required indicators, such as debt service coverage ratio (DSCR), etc
- Example legal documentation (in word format), for instance template contracts - minimising or even eliminating potential extensive legal costs
- Data on such things as biomass parameters, e.g. BTU values (i.e. heat value/energy content) of woody biomass, etc
- Basic technical rules of thumb / engineering support
- Structure, strategy and finance criteria
- Bioenergy-related RD&D (research, development and demonstration) support
- Government support available in selling bioenergy to end users and other measures to secure markets
- Special tools / instruments, e.g. risk analysis tools, risk mitigation instruments
- Risk sharing mechanisms, and further investment incentives
- Guidelines on how to effectively undertake lobbying activities in order to maximise the prospects of a potential introduction of subsidies for bioenergy projects - subsidies are an important option to reduce the high bioenergy upfront costs
- In some African countries, some of these types of support are already available if one seeks them out; however, given that most developers are not aware of them, this means that these types of support need to be publicised better.

One-stop shop for bioenergy project developers and project investors:

Many of the challenges related to facilitating the financing of bioenergy projects/ventures in Africa could be addressed through the set up of nationally/regionally centralised facilities where relevant market knowledge can be accessed by project developers, as well as project financiers. These "Bioenergy One-Stop Shops" would need to be physical, on-the-ground establishments, but also online information portals.

The scope of these (potentially government-subsidised) one-stop shops should cover a comprehensive set of areas relevant for project developers and project financiers alike, including

- Categorised lists of national, regional and sub-regional bioenergy market players
- Potential sources of financing and their main requirements
- Potential sources of bioenergy-related assistance programmes, such as the World Bank's ESMAP programme (Energy Sector Management Assistance Program). ESMAP is a global technical assistance program helping build consensus and providing policy advice on sustainable energy development to governments of developing countries and economies in transition
- Market, technical and good practice reports
- Standard contract templates and other legal documentation
- Guidance and templates to develop (pre)feasibility studies and business plans
- Bioenergy practitioner fora to exchange information on new developments and challenges

Trade of bioenergy products:

Another area that can contribute to facilitating the financing of bioenergy projects in Africa is to take advantage of trading opportunities of bioenergy products. Bioenergy trading aspects are covered in more detail in section 4 of this report, however, the trading parts most relevant to this particular section are i) the (further) development of regional, national and international export/import markets for bioenergy products, such as raw materials or biofuels and ii) the provision of export/import finance support which would increase the chances of success to realise international trade opportunities of bioenergy products.

National support measures:

There are a number of support measures that can be led from the national level, e.g.

- Design of general ranking of the easiest and most viable bioenergy project types, supporting the realisation of low hanging fruits first to build momentum
- Integration of renewable energy / bioenergy financing into the energy budget
- Fighting corruption and bureaucracy in government
- Grant funding for early-stage project financing requirements, e.g. pre-feasibility studies
- Renewable portfolio standards requiring electricity suppliers to source a percentage of the energy e.g. from bioenergy
- Actively encourage the creation of bioenergy bodies/associations to facilitate the communication process between government, developers and financiers
- For bioenergy projects utilising organic waste residues, attractive revenue-sharing schemes should be developed to provide all players involved in the collection and management of waste with clear incentives

Good practice examples in African countries:

A number of African countries have started the process of developing measures to support bioenergy project developers and to create investor security. Kenya, for example has recently launched the National Task Force on Accelerated Development of Green Energy (coordinated by the office of the Prime Minister). Another example is Rwanda, where the Ministry of Infrastructure and Energy (MININFRA) is piloting a number of bioenergy programmes with the support of development partners and with the help of a strong staff base dedicated to the development of bioenergy. In Zambia, the Development Agency has started the process of making energy a priority sector through a number of measures, including the provision of incentives to investors (tax

breaks). Another example is Mali, where a legal framework specific to the biofuel industry is currently being developed. Finally, the Government of Tanzania has implemented a number of measures to promote the sector's development and develop legislation to stimulate use of biofuels, including the creation of the National Biofuels Task Force (in 2006), the enactment of a number of policies supportive of bioenergy and the integration of a statement on blending biofuels with mineral petrol in the New Petroleum Supply Act.

Potential solutions around the carbon market:

The aspects set forth below present carbon market-related potential solutions in four different categories, i.e. 'national level', 'capacity building', 'carbon trading activities' and 'other potential solutions'.

National level:

On a national level, the following carbon market-related measures could be taken to contribute to facilitating the financing of bioenergy projects in Africa:

- Creation and provision (online and offline) of simple and easily understandable documentation to introduce the concept behind the carbon market, as well as all national and international opportunities and issues relevant to carbon financing in Africa
- Creation and provision (online and offline) of a database of i) African carbon market players, ii) existing African carbon projects, utilised methodologies, etc. and iii) a general ranking of the easiest and most viable carbon project types in the African context
- Resolution of issues around Designated National Authorities (DNAs), i.e. shortening of the DNA approval process and increase of staff (availability) within DNAs (e.g. staff often only working part-time)
- Effective institutional framework and specific instruments to support CDM investments in Africa, e.g. public benefit charges to support CDM / bioenergy projects and creation of CDM financing schemes by private banks

Capacity building:

With expertise regarding the carbon market and/or bioenergy projects very often being insufficient across Africa, capacity building is one means to increase the chances of success of these types of projects.

Useful measures in that respect include documentation and training sessions (for instance integrated into the offer of the aforementioned bioenergy one-stop shops) concerning the opportunities and risks of the carbon market in Africa. One example of existing efforts in this area is the Green Knowledge Institute at ACCE (African Carbon Credit Exchange) which can create training modules on the carbon market for the financial sector.

Another aspect related to building up carbon market-related expertise across the various market players in Africa is the creation, dissemination (online and offline) and maintenance of a 'carbon market best practice' database. This could include information such as the minimum land availability required to make carbon financing viable for bioenergy projects in order to justify carbon financing transaction costs. Such minimum land availability could be around 5,000 – 10,000 ha.

One area that would be particularly useful for project developers in terms of accessing financing for their ventures is to build up expertise in the market in terms of how to identify and secure up front purchase commitments for carbon credits. Such commitments can then be used to collateralise loans to fund project development.

Carbon trading activities:

A relatively new concept within the carbon market community in Africa is that of carbon trading, i.e. the buying and selling of carbon credits. Aside from developing carbon projects, carbon trading offers significant opportunities to generate revenues for the development of bioenergy ventures.

The two key market players in the area of carbon credit trading activities in Africa are the African Carbon Credit Exchange (ACCE) headquartered in Lusaka, Zambia and the African Climate Exchange (ACX) headquartered in Addis Ababa, Ethiopia. The respective scopes are as follows:

- The ACCE offers three complementary products and services [1], i.e. i) a trading platform bringing together buyers and sellers of carbon credits, ii) a 'Low Carbon Africa Fund Portfolio', investing in low carbon projects, providing related support and advisory services and iii) the 'Green Knowledge Institute' selling knowledge and technical skills around carbon finance and low carbon development.
- The ACX serves as a clearinghouse for GHG reduction project development in Africa. The ACX's service offering spans across capacity building (i.e. identifying and promoting carbon projects), project evaluation and approval (i.e. supporting DNAs), project finance (i.e. linking project developers with financing sources), project management and oversight (i.e. expertise in developing and managing projects) and market facilitation (i.e. commercialisation support for carbon credits).

While these two key players have created a solid foundation for (future) carbon trading activities in Africa, there are measures that -if realised- would be beneficial to the development of this sector. This includes the dissemination of more in-depth information regarding carbon trading and its opportunities and risks in the African context. Furthermore, carbon trading activities need to be provided with a strong enough supporting framework, i.e. (adequately skilled) human resources, technology, regime certainty, development of methodologies appropriate for Africa, innovative financing, etc. Such a framework also includes the strengthening of policies supportive of carbon trading activities.

Other potential solutions around the carbon market:

This sub-section provides a brief list of a number of aspects which do not fall into any of the other categories above:

- In order to promote carbon market activities in Africa, the carbon finance approval process needs to be streamlined, i.e. it needs to be made shorter and more predictable; this includes aspects, such as reducing transaction costs through simplified modalities and procedures;
- Decreasing the currently very high costs for CDM projects in Africa, which seriously restricts the viability particularly of small-scale projects;
- Some carbon financing funds, such as those under the World Bank Carbon Finance Unit (which includes the BioCarbon Fund [22]), require a very complex application process; it would therefore be very beneficial to project developers if these kinds of applications were either simplified or if application-related support was provided for applicants (ideally, free of charge);
- The influence of existing international funding agencies like the World Bank and the Global Environment Fund (GEF) could be utilised to continue efforts to standardize CDM bioenergy project operation;
- Continued efforts to develop risk sharing or risk mitigating mechanisms for carbon financing would be beneficial; this includes specialised carbon finance-related insurance products to cover carbon-specific risks, and underwrite projects;

4 TRADE

This section presents the relevant aspects around bioenergy-related trade in Africa. In particular, three areas are covered, i.e. a general overview of bioenergy-related trade aspects (in sub-section 4.1.1), the issues at hand (in sub-section 4.1.2) and possible solutions (in sub-section 4.2).

4.1 OVERVIEW AND ISSUES

4.1.1 OVERVIEW

The main drivers for international trade of biomass/bioenergy are the (high and volatile) oil price, as well as global policies and regulations regarding i) obligations to reduce greenhouse gas emissions, ii) biomass used for energy generation (electricity, heat) and iii) blending regimes to replace fossil fuel-based transport fuels with biofuels [10].

However, despite the potential opportunities for exporters²⁰ and importers²¹ resulting from bioenergy trade activities²², there are a number of reasons that present significant hindrances regarding the development of trading activities of bioenergy(-related) products in Africa. The types of barriers in this context can be direct or indirect issues and include political/regulatory, economic, technical, logistical and legal barriers, issues regarding project scope and land availability, as well as potential conflicts with food production.

With respect to the types of bioenergy-related products and potential trading markets and trading partners that could potentially benefit from trading activities, these are as follows:

- *bioenergy(-related) products*: energy from biomass, including biofuels, i.e. bio-ethanol and bio-diesel; solid fuel commodities (torrefied, pelletised, etc.) for coal replacement; unprocessed feedstock; fertiliser products; as well as biomass cook stoves or carbon offsets.
- *potential trading markets / trading partners*: local traders of fertiliser products and biochar; petroleum companies for the purpose of blending (ethanol and biodiesel); manufacturing industries; the public sector (e.g. governments); energy and commodity brokers; but also cook stove retailers, as well as project developers and purchasers of carbon finance project outputs.

In terms of the quantitative overview of the production and trade of the three main biomass commodities bioethanol, biodiesel and wood pellets (i.e. the low moisture content, high energy density wood fuel commonly produced from compacted sawdust), the table below illustrates two main aspects: firstly, bioethanol is by far the dominating biomass commodity in terms of global production (52.9 million tonnes compared to 10.6 million tonnes of biodiesel and 11.5 million tonnes of wood pellets), and secondly, the global trade-related trends show a different picture, i.e. only 7% of the global bioethanol production is traded, whereas that ratio rises to 27% for biodiesel and to 35% for wood pellets.

²⁰ e.g. sustainable management of natural resources, agricultural diversification, additional income, increased employment, reduction of poverty – all which especially important for rural communities

²¹ e.g. fulfilment of GHG emission reduction targets in a cost-effective manner, fuel mix diversification, more sustainable energy production

²² as already established in earlier trade-related work of COMPETE's WP5, i.e. D5.5 'Synthesis report on international trade'

Table 2: Overview of global production and trade of major biomass commodities in 2008 [10]

	Bioethanol	Biodiesel	Wood pellets
Global production in 2008 (tonnes)	52.9 ^b	10.6 ^c	11.5 ^d
Global net trade in 2008 (tonnes) ^a	3.72 ^b	2.9 ^c	Approx. 4 ^d
Main exporters	Brazil	United States Argentina, Indonesia and Malaysia	Canada, USA, Baltic countries, Finland, Russia
Main importers	USA, Japan, European Union	European Union	Belgium, Netherlands, Sweden, Italy
a	While biodiesel and wood pellets are almost exclusively traded as an energy carrier, bioethanol may also be used of other end-uses. As a rough guess, more than 75% of the traded bioethanol is used as transport fuel.		
b	Based on FAPRI (2009), EurObserv'ER (2009) and Martinot and Sawin (2009)		
c	Based on FAPRI (2009), (Martinot and Sawin, 2009), (CARD, 2008) and EurObserv'ER (2009)		
d	Based on Sikkema et al. (2009), Bradley et al. (2009) and Spelter and Toth (2009).		

A more detailed picture of the bioethanol and biodiesel trade situation is provided by the two tables below, illustrating a) the undisputed global market leadership of Brazil as the by far largest bioethanol exporter and b) a more balanced distribution of exporters and importers in the case of biodiesel.

Table 3: Overview of bioethanol trade in 2008 (million litres) [10]

<i>Net Exporters</i>		<i>Net Importers</i>	
Brazil	4410	United States	1651
China	197	European Union	1204
		Canada	625
		Japan	564
		ROW	563
Net Exports	4607	Net Imports	4607

Table 4: Overview of biodiesel trade in 2008 (million litres) [10]

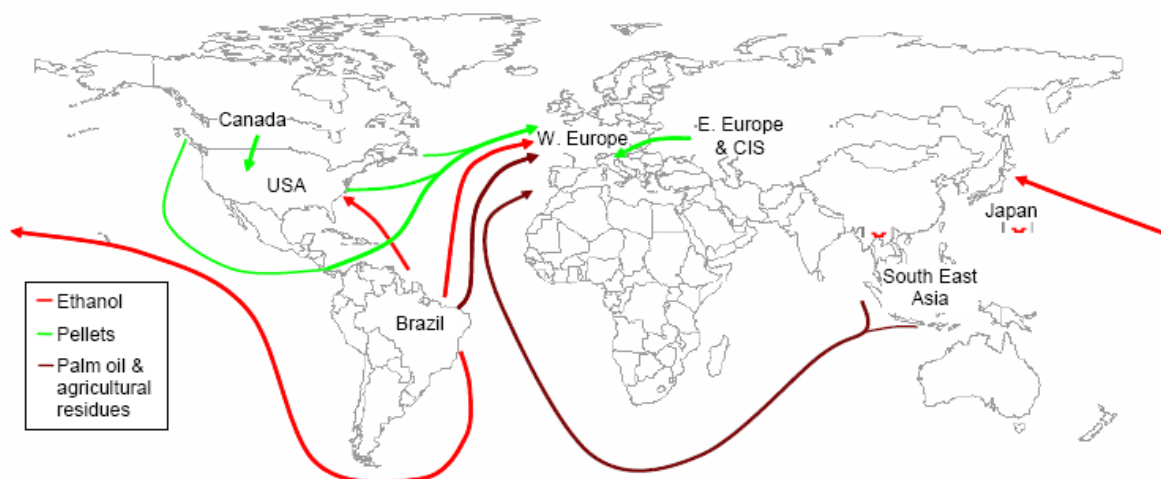
<i>Net Exporters</i>		<i>Net Importers</i>	
Argentina	999.42	European Union	1,135.71
Brazil	-3.78	Japan	15.14
Indonesia	386.14	ROW	1,760.35
Malaysia	193.07		
United States	1,336.35		
Net Exports	2,918.77	Net Imports	2,918.77

With respect to wood pellets, global production is mainly originating from two geographical areas, i.e. Europe and North America with a production of around 8 million and 3.2 million tonnes in 2008, respectively. Global trade of wood pellets has been growing exponentially over the last decade,

with main export activities being out of Canada (1.4 million tonnes) and the EU (2.7 million tonnes, the vast majority of which being intra-EU trade).

The above figures regarding bioethanol, biodiesel and wood pellets illustrate high growth rates in terms of both, production as well as trade on a global scale. However, these figures also illustrate that Africa is largely excluded from these growth trends, with African bioenergy-related trading activities currently being very small (an exception being for instance bio-ethanol exported from Congo, Swaziland and Zimbabwe and wood chips and particles exported from South Africa)²³. This is confirmed by the diagram below illustrating the international bioenergy shipping routes.

Figure 11: Main international bioenergy trade routes [4]



The trend of Africa's negligible involvement in international bioenergy trade is not expected to change massively -at least not in the short-term- and it is due to three main reasons which have a major impact on the demand for biofuels (potentially) produced in Africa. The first two reasons are the protective agricultural and trade policies in the two biggest biofuel markets U.S. and EU and the third main reason in this context is the uncompetitive production costs of biofuels in Africa.

As for the future prospects, even if the unexpected case of a considerable change in agricultural and trade policies in the two big consumer markets U.S. and EU was to happen, then Africa is only expected to potentially benefit from an increase in biodiesel production (from e.g. palm oil and jatropha), whereas the vast majority of the potential additional increase in bio-ethanol trading activities would be covered by Brazil, based on its expansion capacity and its cost advantage.

This situation applies first and foremost to *international* biofuel-related trading activities, i.e. it does not reflect possible opportunities resulting from potential intra-regional bioenergy-related trading activities.

Finally, this section only covers liquid biofuels and solid biomass, but it does not cover trading opportunities from non-energy trading services, i.e. renewable certificates and carbon credits (which are already covered in other sections of this report).

²³ Source : [28]

4.1.2 ISSUES

This section sets out issues with a negative impact on bioenergy trading activities in Africa, especially in the following three areas: infrastructure/logistics-related issues, regulatory / policy issues and other types of issues not falling into any of the first two categories. Overall, aside from the global bioenergy demand drivers of trade and agricultural policies and the volatile oil price, the bioenergy trading activities in Africa are seriously affected by i) insufficient biofuel and biomass production in the first place and ii) an insufficient infrastructure to gather, process and transport the biofuels and biomass.

Infrastructure/logistics-related issues:

- *Generally bad infrastructure in Africa* makes transport of physical goods and therefore trading very challenging and costly;
- *Land transport costs in Africa are generally much higher than transport by sea;*
- *Insufficient availability of densification technologies for solid biomass products* (e.g. wood pellets); these are important in order to improve the financial viability of related trading activities - yet, the availability across Africa of low cost technologies required to compact biomass is very limited;
- *Insufficient availability of suitable vessels* for international sea transport of biofuel and biomass products;
- *Port inadequacies*, e.g. insufficient facilities for handling and storage *and low port productivity*, resulting in high operating costs and as a consequence, higher landed costs;

Regulatory / policy issues:

Strong dependency of international trade prospects of bioenergy products (most of all of biofuels) on European and American trade and agricultural policies, as these establish the demand from these two main global bioenergy markets.

Governmental support schemes, such as tax exemptions and subsidies for biofuel production (especially in developed countries). One of the main objectives of these support payments is to back and secure domestic agricultural feedstocks and markets. As a result, domestic producers are shielded from foreign competition, which in turn impedes international trade.

Import tariffs are too high in many potential target markets: examples are for instance tariffs on bioethanol imports applied by the EU (0.192 € per litre) and the U.S. (0.1427 US\$ per litre and an additional 2.5% ad valorem) [10].

Imposition of export tariffs, mostly levied on feedstocks/raw materials in order to create incentives for investment in the *production* of the final product (e.g. biofuels). Examples include Argentina where different export tariffs are applied to soybean oil (32%) than to biodiesel (20%). In Russia, roundwood is subject of such a tax levied, ultimately impacting (although only indirectly) wood pellet trade.

Loopholes in relevant legislation: Especially in the U.S. and the EU, there have been cases where biofuel market participants have taken advantage of loopholes in relevant legislation, thereby circumventing for instance import tariffs. One example in this context has been reported in the EU, i.e. the blending of bioethanol with other chemicals enabling the subsequent import as a “miscellaneous chemical”, resulting in a much lower import tariff.

Sustainability criteria / sustainability certification systems creating bioenergy trading-related issues: While the development of sustainability criteria / sustainability certification systems for biofuels is a means of making biofuel feedstocks, production processes and end products more sustainable,

there are cases in this context which result in major issues relevant to bioenergy trading activities. A first such example is related to the criteria that need to be fulfilled for the sustainability certification systems. If these are too strict for developing countries (e.g. in terms of technological, financial, legal or monitoring / certification capabilities required to fulfil them), then this effectively excludes these countries from being able to participate in biofuel trading activities. On the other hand, though, these sustainability criteria must be strict enough for the whole certification system to not become pointless. Another issue affecting bioenergy trading activities is the risk of lacking international harmonisation of the various sustainability certification schemes in place, which -if not resolved- can result in a major hindrance for the international trade of biofuels. Overall, it has to be noted that the issues related to sustainability certification systems are particularly applicable to the trading potential of bioethanol.

Patchy global GHG emission reduction obligations, ranging from market leaders such as the UK (Climate Change Act 2008: 80% reduction in GHG emissions until 2050) to the two biggest global GHG emitters, i.e. China and the U.S. that do not have any legally binding emission reduction obligations in place at this stage.

Political activities in some countries resulting from negative reaction to biofuels (e.g. food-versus-fuel issue, sustainability doubts): In Germany, for instance, authorities have -following this debate- reduced quotas and increased taxes.

Negative impact of non-tariff barriers on bioenergy trading activities: There are three aspects related to non-tariff trade barriers²⁴ illustrating their negative impact on bioenergy trading activities, i.e. i) NTBs can impede trade liberalization and economic integration between countries; ii) NTBs can have serious impacts on business costs and market access and iii) NTBs become more and more important, especially given that tariff barriers are coming down. Examples of NTBs include:

- Customs clearance procedures
- Import/export regulations, such as export prohibitions, export licensing, export duties and levies, minimum export prices
- (Phyto)Sanitary measures (especially an issue for solid biomass such as wood chips)
- Non-tariff fees (e.g. pre-shipment fees, warehousing fees, road tolls)
- Technical regulations
- Transit fees and transit requirements, i.e. procedures, requirements, payments realised *outside* of those in the officially adopted and publically made available trade-related publications
- Standards, i.e. requirements (e.g. a chemical content) which cannot be met by imports or exports
- Quota restrictions
- Seasonal restrictions

Other issues:

- *Uncompetitive production costs of biofuels in Africa* – a fact illustrated by the example of sugarcane-ethanol production costs, which range from 0.25 – 0.6 USD per litre in Zimbabwe and Malawi, compared to a production cost range of 0.19 – 0.25 USD in Brazil²³.
- *Limited commercial viability of trade of bioenergy by-products*
- *Ineffective physical trade of biomass or energy carriers*: given cost as well as GHG mitigation issues, physical trade is not always the most effective solution

²⁴ i.e. any regulations other than a tariff or other discretionary policies that restrict international trade resulting in unjustified or unnecessary costs are or measures whose implementation inhibit trade in an illegitimate manner

- *Insufficient technology transfer and capacity building*
- *Limited availability of suitable feedstock in Africa*
- *Uncertainty of future availability and price of biomass feedstock*

4.2 POTENTIAL SOLUTIONS

This section presents a number of potential solutions that can promote bioenergy trading activities in Africa – in particular related to areas of regulation / policy, infrastructure and economy / market. Most of the suggested measures have the potential to create additional and/or get better access to existing sales markets for bioenergy products, in turn improving the opportunities to finance bioenergy projects. However, given the scale required to offset transaction, transport and other costs in this context, trade of bioenergy products mostly benefits larger bioenergy project developments. Small-scale bioenergy projects in Africa (which are a particular focus of the COMPETE project) can therefore tap the trade-related potential benefits best when being part of a larger network, for example an outgrower scheme.

Overall, the main aspects carrying a potential to boost bioenergy trading activities are related to the following areas: creation of new markets for agricultural products (particularly useful for rural communities), policies regarding biofuels for transportation purposes (bioethanol, biodiesel), policies for use of biomass for heating and electricity generation (e.g. wood pellets) and on a more global level, energy security, GHG emission reductions and fossil fuel prices (particularly oil) – with the latter two aspects being deemed by the market to have the biggest impact on bioenergy trading activities in Africa.

Infrastructure / logistics-related potential solutions:

- *Overall, improvements and expansions of distribution and transportation infrastructure;*
- *Securing of local markets for bioenergy products:* Given the generally bad infrastructure in Africa, it is often commercially most viable to use biofuels locally;
- *Strategic locating of biofuel-related infrastructure:* given that land transport costs in Africa are much higher than transport by sea, it is advisable to locate biofuel-related infrastructure close to ports, such as distilleries, enabling the feedstock delivery by sea;
- *Promotion of technology transfer:* In order to increase the availability of relevant technology, such as densification technologies for solid biomass products (e.g. wood pellets), further efforts to promote technology transfer are required;
- *Improvement of maritime shipping capacity:* The required further development of the maritime shipping capacity for tradable biomass (both liquid, as well as dry material) is linked to both increasing the number of suitable vessels²⁵ (e.g. ethanol and biodiesel need to be shipped in chemical tankers), as well as to improving port facilities (e.g. handling, storage, access to land transport connections and general facilities to accommodate large vessels) and port productivity overall.
- *Other measures to minimise the risks related to enabling low cost, reliable and efficient transport of biofuels and solid biomass* include the establishment of i) consortiums of biomass shippers, ii) bioenergy transport investment funds, iii) market consensus about the necessity

²⁵ Current global projections of additional shipping capacity required to satisfy demand for biofuels and solid biomass are as follows: over 150 new handysize tankers for biofuel exports up to 2014 and an additional 400 similar sized ships to satisfy projected exports of anticipated 2nd generation biofuels volumes. [4]

of flexible ship designs allowing subsequent ship modifications at low(er) cost and iv) long-term maritime bioenergy shipping contracts in those markets where supply and demand are adequate and current shipping costs are low.

Regulatory / policy-related potential solutions:

Increase in government support for national biofuel industries: this includes different types of policies and instruments with two main target areas being support for biofuel feedstock production on the one hand and support being directly linked to the biofuel volume produced on the other hand [10]. The former includes subsidies and grants to build the necessary biofuel production infrastructure (for instance manufacturing plants and refineries). These subsidies result in a direct improvement of returns for investors through a decrease in fixed costs and lower investor risk. The latter, i.e. the subsidies directly connected to the production or consumption of biofuels, comes in the form of fuel-excite taxes and of tax credits and grants awarded for the production, sale and blending of biofuels.

In addition to the implementation of measures that directly support biofuel producers, another potential solution in this context is to increase the competitiveness of biofuels. One means to achieve this is to reduce or ideally eliminate subsidies to farmers in the end markets, thereby decreasing the relative cost of imported biofuels (e.g. from Africa).

Reduction of tariffs or waiving of duties altogether: this could for instance be realised through the promotion of preferential trade arrangements between target markets and African countries [10]. The EU and a number of developing countries for instance have struck such preferential trade agreements, i.e. the Generalised System of Preferences (GSP), the Everything but Arms Initiative (EBA – duty free and quota free access) or the Cotonou Agreement (ACP Group of African, Caribbean and Pacific countries). Among the African countries that have benefitted from such agreements are ethanol exporting countries, such as the Democratic Republic of Congo (EBA), South Africa (GSP) and Swaziland and Zimbabwe (ACP). Other measures in this context include collaboration with local country governments to eliminate import taxes on bioenergy-related products (currently at 40% and higher).

Minimisation / removal of non-tariff barriers (NTBs): the minimisation, or ideally removal, of non-tariff barriers carries a number of important benefits that can promote intra-regional trade activities [19]. Two key measures in this context refer to arbitrary NTBs and to customs administration NTBs. As for the former, these are mostly related to corruption, lack of suitable training and lack of harmonisation and include the prevention of -arbitrary changes in road and border tolls; -temporary bans on selected products; -non-acceptance of certificates and trade documentation; -incorrect tariff classification. With respect to the latter, i.e. how to remove customs administration NTBs, one means is to improve the effectiveness and efficiency of customs administration, for instance through the introduction of reliable, computerised and harmonised systems. A successful example in this context is ASYCUDA (Automated System for Customs Data), a computerised customs management system developed by a technical cooperation programme of UNCTAD (United Nations Conference on Trade and Development), which covers over 80 countries. The benefits resulting from the introduction of such a system include a reduction in both transaction times and corruption, as well as an increase in revenue collection. Finally, all measures to remove NTBs also need to be accompanied by NTB monitoring mechanisms.

Lowering of unjustified technical standards of biofuels [10]: overall, technical standards are either in the form of physical and technical properties of the biofuels themselves or as maximum percentages of biofuels allowed to be blended with vehicle fuels. While a certain level of technical standards is required to prevent any safety issues, damages to vehicles' engines and/or high emissions, unreasonably high technical standards inhibit biofuel trade. A specific example in this context is the maximum iodine threshold set for vegetable oils (which are a component in the

production of biodiesel) in the EU, in turn clearly favouring (the EU-produced) rapeseed oil over (the non-EU produced) soy oil and palm oil as a feedstock in the biodiesel manufacturing process. Another illustration in this regard are too high standards in the wood pellet production process (e.g. with respect to the maximum ash content), thereby increasing production costs, which in turn inhibits market (and therefore trade) opportunities – especially applicable to relatively young markets such as the one for wood pellets.

Creation of technical standards for wood pellets: while in some cases the enforcement of technical standards can be detrimental to the trade of biofuels, in other cases their compulsory implementation can actually create additional trade opportunities. When it comes to wood pellets, for example, criteria such as durability, ash content or size are critical to the safe utilisation of wood pellets as a heating fuel – be it in the domestic heating market (where ash content is critical) or in the industrial context (where certain standards have to be met e.g. in co-firing plants with coal). In either case, the establishment of internationally aligned, recognised and enforced technical standards contributes to two important aspects which in turn facilitate trade activities, i.e. i) the removal of market uncertainties regarding origin and quality of wood pellets and ii) the reduction of transaction (i.e. information) costs.

Sustainability criteria / certification systems for biofuels: one option in this context is the enforcement of sustainability criteria / certification schemes as part of mandatory regulation for biofuel feedstocks, production processes and end products – as has been the case with the publication of sustainability criteria in the renewable energies directive (RED) of the European Commission (2009). The fulfilment of these sustainability criteria can then be made a requirement for tax breaks, subsidies or other types of policy incentives. Another opportunity in this context are voluntary sustainability standards²⁶ which differentiate sustainably produced biofuels from those of less sustainable competitors, resulting in (expected) higher prices for the certified products. At the same time, a harmonisation of internationally recognised sustainability certification schemes would improve the market relevance of these certification efforts and would be a helpful step towards ending the current debate regarding the sustainability of bioenergy, for instance with respect to the impacts on biodiversity, food production and GHG emissions.

Recent trade liberalisation activities across Africa: these include the creation of the expanded free trade zone in 2008 covering over 30 African countries, i.e. member countries of COMESA (Common Market for Eastern and Southern Africa), SADC (Southern Africa Development Community) and EAC (East African Community). The establishment of this expanded free trade zone can contribute to the economic development across these countries and is perceived to be a potential step towards efforts to establish a monetary union, i.e. a common currency in large parts of Africa. Example of free trade areas across the Southern part of Africa include:

- 13 out of 19 COMESA countries (Common Market for Eastern and Southern Africa)
- 12 out of 15 SADC (Southern Africa Development Community) countries: 85% of all trade activities within the area of the SADC are duty free! [16]
- EAC (East African Community) has launched the East African Common Market Protocol (free movement of all goods and services within the EAC).

Economic / market-related potential solutions:

- *Increase in scale of production / factory size*, thereby improving (cost) competitiveness of African biofuels; this would result in coordination of (additional) feedstock supply and distribution channels required to reap benefits from economies of scale;

²⁶ Examples include the Roundtable on Sustainable Biofuels (RSB) and the Global Bio-energy Partnership (GBEP) for biofuels and the Green Gold Label and the GDF-SUEZ / Electrabel label for wood pellets

- *Establishment of local production capacity*, e.g. promoting local partial assembly of otherwise imported products; this would promote local capacity building, thereby minimising imports of bioenergy-related products (example: high quality clean cook stoves manufactured outside Africa and imported into Africa, as they are not currently available for sale in Africa);
- *Development of niche markets for biofuels*, including airline biofuel trial projects.

5 DEVELOPMENT OF MARKETS

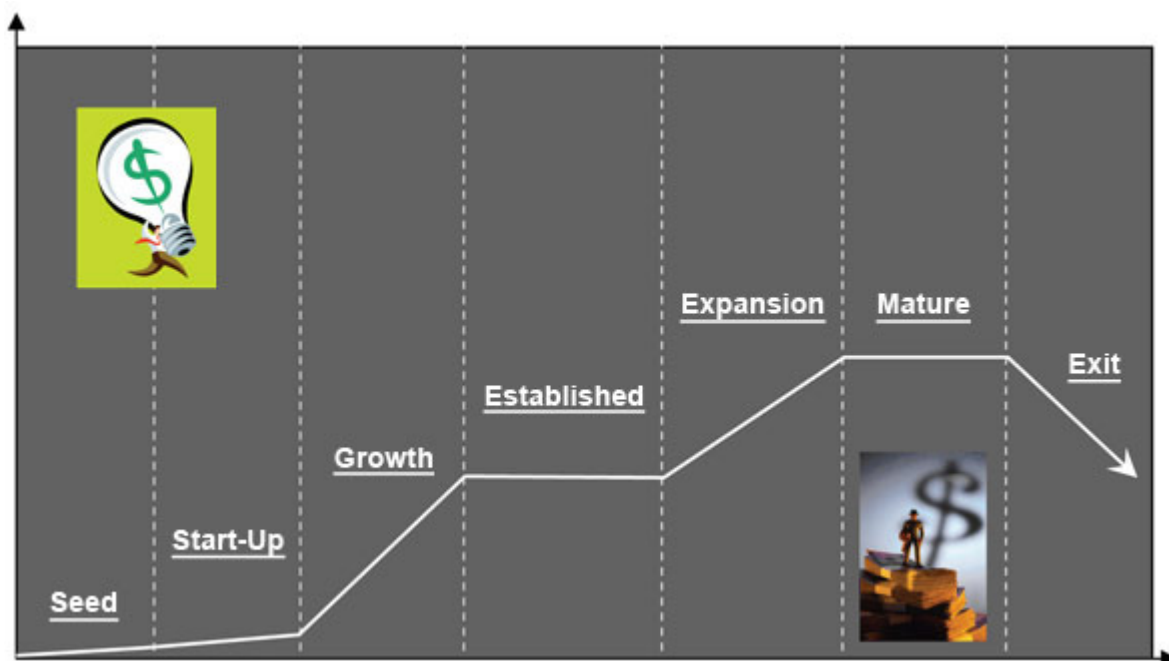
This section presents the relevant aspects around the link between the financing of bioenergy ventures and any relevance to the development of related markets in Africa. In particular, three areas are covered, i.e. a general overview (in sub-section 5.1.1), the issues at hand (in sub-section 5.1.2) and possible solutions (in sub-section 5.2).

5.1 OVERVIEW AND ISSUES

5.1.1 OVERVIEW

Given the nature of the bioenergy market in Africa, the types of funding that project developers in Africa require to finance their bioenergy ventures are mostly across the early-stage business development cycle stages (as illustrated in the figure below), i.e.

- *Seed phase*: this phase requires at risk speculative development funds to develop an idea with the objective to turn it into a financially self-sustained business. However, given the risks around market demand (e.g. supportive policies, potential client base), market supply (e.g. feedstock, yields), as well as more generic capacity-, technology- and market development-related issues, financing institutions often perceive bioenergy as high risk investments, making it very difficult for project developers to obtain funds from the financing sector. Most likely sources of financing at this phase of the business development cycle are therefore own equity/shareholder funds, (government) grants / subsidies, international development institutions (e.g. World Bank, UN organisations), NGOs, at risk funding (which, however, comes in exchange for large equity share) and potentially venture capital or forward sales of project outputs.
- *Start-up phase*: once the business is up and running, it needs to increase its market presence and customer base. Along with slowly incoming revenue, businesses at this stage of the business life cycle still require further development funding to bring in further projects, clients and revenue. The negative correlation between the businesses' risk profile and their attractiveness to financial institutions results in an increased likelihood of funding being provided from that sector. At this phase, project funding options are similar to the ones in the seed phase – however, additional sources potentially available include carbon finance, mezzanine finance providers (i.e. debt capital giving lenders the right to convert to an ownership or equity interest in the company in the case of loan default), supplier credit and secured debt from financing institutions.
- *Growth phase*: at this stage of the development of the business, revenues, customers and profits are increasing, and the business requires additional long-term equity/long-term debt and working capital to finance further growth. In this context, project developers are keen to retain control of the business and aspire to get investors on board that are interested in a long-term business relationship. New market players entering the pool of potential financing providers at this stage of the development of the business include institutional investors / the capital market and loans and equity investments from specialized private sector investors as well as some European and non-European country governments.

Figure 12: The 7 stages of the business life cycle [29]

The different types of markets available to project developers at the different business development stages, however, are poorly developed in most parts of Africa, indicating some degree of market failure in this context with respect to the provision of the different types of financing.

5.1.2 ISSUES

This sub-section covers the issues around the link between the financing of African bioenergy ventures and any relevance to the development of related markets. The issues are presented from project developers' and project investors' points of view and are related to different aspects of financing of African bioenergy ventures and its relevance to the development of related markets, in particular a) from the demand side, b) from the supply side, c) from other aspects and d) in relation to the carbon market.

Issues with relevance to the development of related markets – demand side aspects:

Among the main issues in this context are generic difficulties of project developers in getting access to financing. One example is the widespread unawareness of project developers of the full picture of the various market players in the bioenergy venture development markets, resulting in an increased likelihood of suboptimal financing solutions supplied to project developers when trying to tap funding for their businesses. Due to this limited understanding of the market landscape, there is a (project developers' perceived) shortage of funds for the purpose of the development of their bioenergy ventures.

Another set of issues preventing project developers from being more successful in attracting funding is a frequent lack of various venture development skillsets. This is particularly the case for small-scale bioenergy ventures and includes for instance the development of (pre-)feasibility studies or a bankable business plan. With the supply side of the enterprise development service

market in Africa being very underdeveloped, this results in a significant challenge for project developers to get access to (affordable) enterprise development support.

An additional issue in this context is related to challenges that project developers face in terms of finding affordable solutions to the implementation of required legal documentation. For example, securing a reliable stream of feedstock is crucial to the success of any type of bioenergy plant, highlighting the strong dependency of the (marketable) output from bioenergy project activities on the supply of the respective input. In the case where the feedstock is supplied from various sources, bioenergy plant operators are required to have contracts in place that provide protection against defaulting contract partners. However, legal advice to establish these types of contracts is expensive, which is particularly counterproductive during the cash-stricken early stages of the business life cycle.

Issues with relevance to the development of related markets – supply side aspects:

Potential issues affecting investor security: One of the most important aspects in this context is related to issues regarding the creation of investor security. Aside from factors influencing expected returns on investment, such as exchange rate, political or regulatory aspects, there is another important criterion driving investment flows, i.e. the (non-)existence of national regulations that potentially impact the free movement of investments and/or profits in and out of countries.

Small projects' difficulties to attract financing: In order to recover the transaction costs involved in the provision of financing for bioenergy developments in Africa, the different markets providing these services (most of all the financial institutions, however) require a minimum size of the development, i.e. there is a negative correlation between the size of a bioenergy development and its attractiveness to the various markets providing funding.

Unawareness of value of 'intermediate-stage' bioenergy developments: there is a common reluctance among investors to commit any funds for bioenergy ventures unless a bankable business plan and technical feasibility are in place. However, project equity can also be sold on at an 'intermediate' stage, e.g. after business plan development, i.e. there are separate markets for pre-feasibility studies / feasibility studies / business plans – options which bioenergy financiers are usually unaware of.

Shortage of relevant insurance products: the insurance market in Africa is underdeveloped in terms of the products offered for project developers to insure bioenergy ventures against failure.

Strict loan security requirements for project developers: financing institutions in Africa require significant security requirements for loans from bioenergy project developers – often rendering loans unattainable for project developers.

Assessment criteria of bioenergy investment opportunities: the vast majority of financing institutions do not place any/enough emphasis on the importance of non-financial criteria (i.e. social and environmental aspects - as applied in the Triple Bottom Line approach) when assessing the attractiveness of bioenergy investments.

Mismatch of suitability of financing instruments to respective project development cycle: market participants are often unaware of which financing option is best suited at the respective development stage of the project.

Issues with relevance to the development of related markets – other aspects:

- *Securing target markets:* one of the main issues for bioenergy enterprises is the development of the demand side of their business, i.e. to identify and secure target markets for their products;
- *Insufficient collaboration project developers - R&D activities:* the success of bioenergy projects depends on a number of aspects, including the right choice of feedstock as well as on growing and harvesting methods. One of the challenges that project developers face in that respect is identifying and growing the most suitable feedstock in a given area - which in turn depends on various issues, including soil condition, rainfall pattern, use of fertiliser, etc. It is evident that finding the right solution to issues of this nature is a time- and resource-consuming process, which is often best taken care of by relevant research & development activities. Unfortunately, the collaboration of project developers with R&D institutions is often insufficient;
- *Unsatisfactory level of local technical expertise:* there is a general insufficient skillset base across Africa regarding the technical aspects of these bioenergy ventures, including installation, maintenance and decommissioning of bioenergy technologies;
- *Infrastructure deficits across Africa:* the prevalent infrastructure deficits across Africa impede access to the various bioenergy product markets, including a) the generation and distribution of electricity from bioenergy (e.g. transmission lines) and ii) the manufacturing, transport and trade of bioenergy feedstock and (by-)products (e.g. rural roads);
- *Land ownership issues:* land ownership by foreign investors is restricted in many African countries;

Issues with relevance to the development of related markets – carbon market-related aspects:

The main issues related to carbon markets in Africa which are relevant to the development of related markets are limitations in five main areas, namely i) regulatory framework; ii) budget; iii) relevant expertise; iv) carbon trading activities; and v) dissemination issues regarding carbon market-related guidance material.

As for the first two aspects in the list above, the issues around the carbon market-related regulatory framework are due to the general uncertainty regarding the future of the carbon price and of global carbon markets as a whole – most of all with respect to the future role of CERs in international offset markets. On a more regional and national level, there is a general lack of institutional framework-induced specific instruments to support carbon market-related investments in Africa – examples being public benefit charges or the creation of carbon project financing schemes by financing institutions. The second issue in the list above is mostly related to the limited budget, availability and experience of Designated National Authorities (DNAs) in most African countries. Both of these issues not only generally undermine investor confidence in this relatively young market, but they also hinder the development of carbon market-related products and services in financial and non-financial markets across Africa.

As for the third aspect in the list above, this is related to a lack of general awareness as well as a widespread scarcity of relevant skillsets and knowledge of carbon financing in Africa. Examples include the lack of competency to analyse risks and understand opportunities in the local financial sector, as well as insufficient local skillsets in terms of the development of carbon projects, e.g. the development of the key documents Project Design Documents (PDDs) and Project Identification Notes (PINs).

Fourthly, there is another set of issues that hinder the development of carbon market-related markets, i.e. those related to carbon trading activities. Carbon trading activities are still at the

infancy stage in Africa, but once the supporting framework (e.g. adequately skilled human resources, regime certainty, etc.) is in place, these offer opportunities in terms of additional revenue generation for the development of bioenergy ventures.

Finally, despite a range of highly useful CDM support activities having been set up in the region, one of the major challenges these activities seem to have in common is the difficulty of widespread dissemination of easily understandable information and guidance material relevant to the various types of eligible on-the-ground projects so that these can actually materialise the carbon market-related benefits to improve the financial viability of their projects.

Examples of these high-level activities that are already happening to help develop African carbon markets include activities ranging from capacity building (e.g. UNDP/UNEP CDM Capacity Building Project), technical assistance programs (e.g. CDM Green Facility), trade fair and knowledge sharing (e.g. African Carbon Forum), carbon finance and CDM training (e.g. African Bankers' Carbon Finance Investment Forum) to a platform for exchange of information on CDM project opportunities (e.g. CDM Bazaar).

Two of the examples mentioned above are the 'CDM Green Facility' and the 'African Carbon Forum'. The former, i.e. the 'CDM Green Facility' is a project -initiated by the Danish International Development Assistance (DANIDA) and implemented by the Denmark-based UNEP Risø Centre- that is dedicated to the provision of bilateral technical assistance activities in six African countries, namely Benin, Burkina Faso, Ghana, Mali, Niger and Zambia. The CDM Green Facility complements the ongoing work of other donor governments and aims to enable beneficiary countries "to integrate CDM into the national economic development plans with the specific objective of increasing the number of emission reduction projects in the infrastructure, energy, and other sectors" [25].

The latter, i.e. the 'African Carbon Forum' (AFC), is a "trade fair and knowledge sharing platform for carbon investments in Africa that brings together representatives from designated national authorities (DNA), national focal points, UN agencies, governments and the private sector" [17]. Launched by the Nairobi Framework partners, the AFC aims to promote CDM activities in Africa by exchanging best practices and lessons learned, as well as by supporting matchmaking and deal facilitation of CDM projects, thereby bringing together the various CDM market players, including project participants, project developers, investors and carbon buyers [17].

5.2 POTENTIAL SOLUTIONS

This sub-section suggests a number of potential solutions around the link between the financing of African bioenergy ventures and any relevance to the development of related markets. The different aspects are presented from four angles, i.e. a) from the demand side, b) from the supply side, c) from 'other' aspects and d) in relation to the carbon market.

Potential solutions with relevance to the development of related markets – demand side aspects:

The first aspect in this context aims at addressing the widespread unawareness of project developers of the full picture of the various market players in the bioenergy venture development market. A potential solution to this issue is to map the bioenergy financing provider markets in Africa and to disseminate its structure (along with short descriptions and relevant contact details) to all interested parties in the bioenergy development arena (e.g. through the aforementioned 'Bioenergy One-Stop Shop' network). The increased awareness of all potential financial market players -ranging from donors / grant providers on the one end to banks, venture capitalists and equity funds on the other end- will a) contribute to a more informed decision making process on the

developers' side and b) result in fewer suboptimal financing solutions for project developers when trying to identify funding options for their businesses. Overall, this will contribute to improved access to financing in the first place, and therefore, to an improvement of the financial viability of bioenergy projects.

Another demand side-related issue that has implications on the development of related markets is related to the frequent lack of general venture development skillsets prevalent across mostly the small-scale bioenergy entrepreneurs in Africa. Given that these types of skillsets -such as the development of (pre-)feasibility studies and business plans- are of particular relevance during the very early stages of the business development cycle (i.e. the seed phase) where funding is particularly scarce, the most beneficial outcome for project developers would be if these services were offered free of charge as part of for instance a separate governmental small enterprise development agency. In terms of the dissemination of the most relevant information and guidance material of such an agency, this could also be done via the 'Bioenergy One-Stop Shop' network.

In order to address challenges that project developers face in terms of finding affordable solutions to put in place required legal documentation, one possible solution to minimising the legal costs for emerging bioenergy ventures is the provision of example legal documents (in word format), for instance in the form of contract templates (online and offline). Just as with the previous two aspects, too, this could be included in the service offerings of the aforementioned network of "Bioenergy One-Stop Shops" in each country, thereby responding to the current market failure of insufficient affordable legal advice for bioenergy ventures. However, in order to counter any potential issues related to non-enforcement of contracts, governments need to put measures in place to improve contract reliability.

All the potential solutions laid out above have the potential to support the development of relevant markets, in turn contributing to improving the access of bioenergy project developers to financing/capital of their bioenergy ventures.

Potential solutions with relevance to the development of related markets – supply side aspects:

Establishing measures to counter the (perceived) shortage of available financing for bioenergy ventures: One of the reasons for project developers' difficulties to access adequate financing for their businesses is a (perceived) shortage of funds available for the development of bioenergy ventures. Two options to address this market failure are a) the dissemination of potential sources of financing to project developers, e.g. as part of a(n) (online and offline) 'Bioenergy One-Stop Shop' network and b) to increase the availability of funds for bioenergy projects through the extended provision of government grants / concessional loan funding for very early stage bioenergy ventures.

Bundling and diversification as a means to increase small projects' ability to attract financing: One possible solution addressing the issue of small projects' inability to attract financing is the development of a market that bundles small bioenergy projects. This serves two purposes, i.e. a) the increase in size of the overall bundle enables the various projects to recover the transaction costs and b) bundling several smaller projects results in diversification which in turn improves risk mitigation.

Less strict loan security requirements for project developers: Financing institutions in Africa often set very strict security requirements for loans for bioenergy projects. One potential solution to this issue is to reduce these security requirements so that project developers have the option give up a large part (e.g. 90%) of the project initially and are able to earn back their equity in line with project progress.

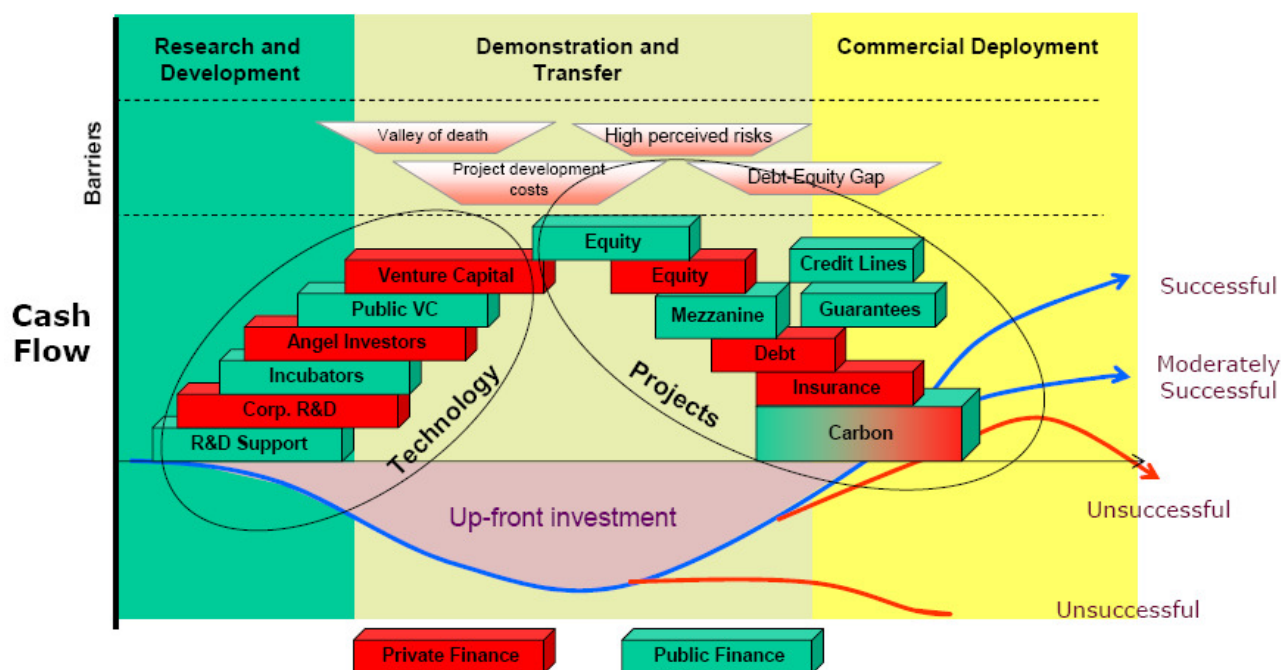
Improvement of awareness of existence and value of 'intermediate-stage' bioenergy developments: In order to address the common reluctance among investors to commit any funds for bioenergy ventures unless a bankable business plan and technical feasibility are in place, one solution to this issue is to increase the efforts to educate the financial sector regarding the existence, risks and opportunities of the markets for 'intermediate stage' bioenergy developments, i.e. that there are separate markets for pre-feasibility studies / feasibility studies / business plans.

Establishment of development insurance on projects (pays out on failure): Given that the insurance market in Africa currently seems to lack products for project developers to insure bioenergy projects against project failure, there is a clear benefit in educating the insurance market in that respect. Such activities create a better understanding of the bioenergy market, its opportunities and risks, which in turn encourages the development of such products in the insurance market, thereby facilitating project financing of bioenergy projects.

Financing institutions' assessment of bioenergy investment opportunities to include TBL-related criteria: While financing institutions' primary criterion in the evaluation of any investment opportunity -and therefore also of bioenergy project opportunities- is obviously the potential financial return, the bioenergy project market as a whole would benefit from an increased emphasis of the financing market players' on non-financial criteria (i.e. social and environmental aspects - as applied in the Triple Bottom Line approach) when assessing the attractiveness of bioenergy investments. The integration of non-financial criteria into the financing institutions' overall evaluation criteria of bioenergy project opportunities forces project developers to place more emphasis on a TBL approach of their projects, which in turn results in a higher (TBL-type) sustainability of bioenergy projects.

Improving the suitability of financing instruments to the respective project development cycle: (Bioenergy) market participants (both on the private, as well as on the public sector side) are often unaware of which financing option is best suited at the respective development stage of the project. This market failure could be improved through a) increased RD&D activities -including the analysis of lessons learned from existing projects- to establish best practice documentation demonstrating the best match of the respective financing option at the respective (bioenergy) project development stage, b) training / knowledge dissemination for the involved private and the public sectors to improve the awareness of these issues and their solutions in order to i) maximise the effectiveness of the public (grant / subsidy) funding made available for bioenergy project development and ii) improve the pre-investment analysis capabilities of the private financial sector in that respect.

The figure below illustrates a number of financing options best suited to the respective requirements at various development stages of clean energy projects.

Figure 13: Financing options at various clean energy project development stages [24]

Improved match of supply of and demand for financing for bioenergy ventures: There is potential to improve the market that matches supply of and demand for financing of bioenergy ventures in Africa. This could be realised through the integration of such services into the scope of a(n) (online and offline) 'Bioenergy One-Stop Shop' network. At the same time, there is scope for the development/improvement of a separate broker market to match supply (i.e. various types of financing/funding providers) and demand (i.e. project developers) for bioenergy ventures.

Potential solutions creating investor security: Creating investor security is among the most important prerequisites to mobilise private capital markets – especially in countries where political and regulatory risks are perceived to be high. There are a number of individual measures that can contribute to the creation of investor security, including

- Improvement of credibility and viability of biofuel market players (e.g. offtakers and developers);
- Investor-supportive regulation with respect to i) reinvesting profits (i.e. profits need to be able to be reinvested outside of national boundaries) and ii) the movement of investments (i.e. investors need to be able to move their investments quickly in and out of countries);
- Improved knowledge and appreciation of bioenergy activities/opportunities in the financial sector;
- Effective means of addressing potential issues regarding the food versus fuel debate;
- Elimination or at least substantial reduction of subsidies for fossil fuel-based energy;
- Measures to prevent potential loss in value of investments in Africa (i.e. counteracting uncertainty in the economy, as well as inflation and depreciation);
- Reduction of the number of donor-sponsored RE projects as these distort markets through the creation of competition / subsidies;

Another very important aspect contributing to the creation of investor security is the putting in place of an investor-friendly regulatory framework securing long-term demand for bioenergy products. One effective means in this context is the establishment of binding national targets for the use of

sustainable biofuels across Africa. Setting such clear targets on a national level to promote the use of renewable fuels in the transport sector is not only important to secure sufficient demand, but as experiences with the European Union's first Biofuel Directive (2003) have shown, the two main reasons for fuel distributors to use biofuels are a) binding legislation being in place and/or b) a sufficiently high financial incentive. A good example of how a process of establishing such a framework could be approached is the European Commission's Directive on the promotion of the use of energy from Renewable Energy Sources (RES) [9]. In order to demonstrate what types of support measures need to be implemented so that national targets can actually be met, a list of the main steps required (in sequential order) to set up a legislative framework of such kind is provided below:

- Setting mandatory national targets for biofuel share (e.g. until 2020);
- Setting binding *interim* targets as a percentage share of the final (e.g. 2020) target;
- Development of national action plans, including adequate measures on how to achieve the targets;
- Addressing barriers that impede the growth of biofuels, i.e. infrastructure development and priority access for renewables to the grid, removal of administrative and regulatory barriers as well as improvements in the provision of related information and training;
- Creation of a sustainability and certification regime for biofuels – binding for and applicable to both, domestically produced, as well as imported biofuels.

In this context, it is crucial to establish and enforce the targets set (both interim, as well as final) – not only in order to monitor progress, but also to penalize non-compliance. An additional benefit of such a penalty system is that its enforcement contributes to an increased trust in the legal system of a country.

Potential solutions with relevance to the development of related markets – other aspects:

Improvement of land ownership-related regulation: In those African countries which have restrictions in place regarding land ownership by foreign investors, the impacts of such regulations on the foreign investment flows for bioenergy ventures need to be considered. One option to improve the market incentives for foreign investors is to adapt such regulations in order to create a regulatory framework to allocate land for bioenergy development, thereby supporting land ownership and leasing options with a focus to support the provision of land unsuitable for food production, but suitable for bioenergy production (including waste land reclamation). At the same time, the development of bioenergy projects needs to a) support rural and social development, b) avoid the displacement of rural population and c) encourage transparency across all stages of the development process, thereby avoid corruption in any aspects related to land tenure.

Creation of markets for bioenergy products: Identifying and securing target markets for bioenergy products is a crucial prerequisite determining the viability of bioenergy ventures. Given that biofuels, for instance, are -not least because of a prevalent subsidy structure for fossil fuels in many African countries- not cost competitive (at this stage), this creates a major barrier with respect to getting access to relevant sales markets. One solution to increase the cost competitiveness of biofuels is the use of governmental instruments, such as taxation, subsidies or grants to reverse the price difference between these two types of fuel in the favour of biofuels. Another effective way in this context is for governments to create a regulatory framework supporting the (mandatory) use of bioenergy. In the case of biofuels, this includes the establishment of blending requirements / biofuel standards. In the case of bioenergy for electricity production, this involves the support of green certification / renewable energy portfolio protocol / Independent Power Producer (IPP) / power purchase agreement schemes. All these measures create a guaranteed market for bioenergy producers, thereby lowering investment risk and costs.

Improved collaboration between bioenergy-related research activities and project development: An improved collaboration between research activities and project developers is mutually beneficial, given that the results of the research activities can be implemented in on-the-ground projects - whereas feedback from project developers regarding the research outputs in turn helps to strengthen the R&D market. One specific example in this context is the establishment of piloting / demonstration projects in collaboration with academic / research institutions, for instance contributing to the establishment of best practice with respect to determining the most suitable feedstock in a given area.

Strengthening of technical skillsets across bioenergy technologies: In order to improve the technical skillsets across the various bioenergy technologies -including planning, installation, maintenance and decommissioning-, one option is the (further) development of markets that provide education and training to strengthen skills and knowledge of local manpower of bioenergy technologies. Aside from a decreased failure rate of the technology-specific aspects of bioenergy developments, this also contributes to an improvement of local education and employment opportunities.

Boosting infrastructure investment to enhance market access for bioenergy outputs: The infrastructure deficits across Africa are one of the main aspects responsible for the difficulties in getting bioenergy products to their respective markets. This includes a) the generation and distribution of electricity from bioenergy (e.g. insufficient state of / number of transmission lines) and ii) the transport and trade of bioenergy feedstock and (by-)products (e.g. insufficient state of / number of rural roads). In order to address this issue, there is therefore a need for infrastructure planning and investment (e.g. transmission lines, rural roads, decentralized power generation facilities) to facilitate access to the various end markets. The high development costs of these investments could for instance be borne either by governments, the private sector or public-private partnerships (PPP).

Potential solutions with relevance to the development of related markets – carbon market-related aspects:

Strengthening of the carbon (financing) market in Africa: As outlined earlier on, the awareness, knowledge and related skillsets of carbon financing in Africa are very scarce, including a lack of competency to analyse risks and understand opportunities in the local financial sector. Given this underdeveloped state of the African carbon (financing) market, it can therefore benefit from three main measures, i.e. i) the establishment of an effective and supportive regulatory framework, ii) capacity building activities benefiting both the financing sector as well as the project development sector and iii) support to kick-start carbon trading activities in Africa.

Increasing budget and experience of DNAs: In order to further develop the carbon markets -and the markets supplying their services to them-, not only is there a need for capacity building of the financing sector and the project developers, but the other players involved in the development, authorisation and approval of carbon projects need to be strengthened, as well. One option in this context is for instance to enhance the (currently limited) budget and experience of Designated National Authorities (DNAs). This contributes to shortening and smoothing the process of the provision of the letter of approval²⁷ to CDM project participants, in turn facilitating the approval and availability of carbon financing to project developers.

Improvement / establishment of carbon market support facilities: One component contributing to building up the African carbon market is the improvement of existing / establishment of new carbon market support facilities by relevant (national and multi-national) market players. Benefits of such

²⁷ The letter of approval confirms the contribution of a project activity to sustainable development in a country

facilities include for instance the engagement of (local) financial institutions and project developers to provide support with the identification, appraisal and transaction of viable carbon opportunities. A very good example in that respect is the Africa Carbon Asset Development (ACAD) Facility. Developed by UNEP²⁸, the ACAD's objectives correspond with the benefits mentioned above in order to overcome the barriers related to the development of the carbon market in Africa. In particular, the ACAD offers three support lines²⁹, i.e. i) risk and transaction cost sharing, ii) technical assistance to project developers and iii) targeted training and outreach for financial institutions. The first of these support lines includes the provision of targeted grants by financial institutions (by complementing project developers' own contributions) to enable the completion of critical aspects such as project validation and environmental impact assessment (EIA). The technical assistance-related support line offers project developers support throughout the advanced stages of the carbon project development cycle, including proving additionality and preparing a monitoring plan. As for the final support line, this provides -in partnership with the local financial sector- training to optimise the realisation of carbon finance opportunities in Africa, thereby significantly improving the carbon finance-related expertise of the financial sector in Africa. Overall, the ACAD supports the establishment of a pool of carbon demonstration projects with the aim to replicate them across Africa, which in turn will reduce transaction costs and free additional finance for carbon projects.

²⁸ with support from Germany's International Climate Initiative (ICI)

²⁹ As described in more detail here: <http://www.unep.fr/energy/activities/acad/pdf/ACAD.pdf>

REFERENCES

- [1] African Carbon Credit Exchange, *About Us*, available at: <http://www.africacce.com/about%20us.html>, accessed August 2010
- [2] African Development Bank, 2008, *Clean Energy Investment Framework for Africa*, available at: <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Policy-Documents/10000025-EN-PROPOSALS-FOR-A-CLEAN-ENERGY-INVESTMENT-FRAMEWORK-FOR-AFRICA.PDF>
- [3] Bindraban, P. et al, 2009, *Can biofuels be sustainable by 2020? An assessment for an obligatory blending target of 10% in the Netherlands*, available at: [http://np-net.pbworks.com/f/Bindraban+et+al+\(2009\)+Can+biofuels+be+sustainable+by+2020,+Scientific+and+policy+analysis.pdf](http://np-net.pbworks.com/f/Bindraban+et+al+(2009)+Can+biofuels+be+sustainable+by+2020,+Scientific+and+policy+analysis.pdf)
- [4] Bradley, D. et al, 2009, *World Biofuel Maritime Shipping Study – for IEA Task 40*, available at: www.bioenergytrade.org/downloads/worldbiofuelmaritimeshippingstudyjuly120092df.pdf
- [5] Chatham House, 2010, *Scaling up Renewable Energy in Developing Countries: finance and investment perspectives*, available at: <http://www.chathamhouse.org.uk/publications/papers/view/-/id/874/>
- [6] Daugherty, E. et al, *Options for Trading Bioenergy Products and Services*, available at: http://www.ieabioenergy-task38.org/publications/options_for_trading_bioenergy_products_and_services.pdf
- [7] Diaz-Chavez, R. et al, *Bioenergy for sustainable development in Africa – environmental and social aspects*, available at: http://www.unido.org/fileadmin/user_media/UNIDO_Header_Site/Subsites/Green_Industry_Asia_Conference__Maanila_/GC13/COMPETE_African_Approach_Biofuels.pdf
- [8] Ernst & Young, Oxford Analytica, 2010, *Business risk report 2010*, available at: [http://www.ey.com/Publication/vwLUAssets/Business_risk_report_2010/\\$FILE/EY_Business_risk_report_2010.pdf](http://www.ey.com/Publication/vwLUAssets/Business_risk_report_2010/$FILE/EY_Business_risk_report_2010.pdf)
- [9] European Renewable Energy Council, 2008, *Renewable Energy Technology Roadmap 20% by 2020*, available at: http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf
- [10] Faaij, A. et al, 2010, *Opportunities and barriers for international bioenergy trade*, available at: <http://www.bioenergytrade.org/downloads/opportunitiesandbarriersforinternationalbioene.pdf>

- [11] First Climate, 2010, *Strategies to managing risks*, available at:
http://www.carbonexpo.de/global/dokumente/carbon_expo/en/conference_programm/260510_Training2_0830_Classen.pdf
- [12] Global Energy Partnership, 2010, *Analytical tools to assess and unlock sustainable bioenergy potential*, available at:
http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/BIOENERGY_INFO/1005_GBEP_-_Bioenergy_analytical_tools.pdf
- [13] Global Energy Partnership, 2010, *Financing options for bioenergy projects and programmes*, available at:
http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/BIOENERGY_INFO/1004_GBEP_-_Financing_options_for_bioenergy_projects_23april_web.pdf
- [14] Green Investment Bank Commission, 2010, *Unlocking investment to deliver Britain's low carbon future*, available at:
<http://www.climatechangecapital.com/media/108890/unlocking%20investment%20to%20deliver%20Britain's%20low%20carbon%20future%20-%20green%20investment%20bank%20commission%20report%20-%20final%20-%20june%202010.pdf>
- [15] International Emissions Trading Association (IETA), 2010, *GHG Market Sentiment Survey, 5th edition*, available at: <http://www.ieta.org/ieta/www/pages/getfile.php?docID=3469>
- [16] Johnson, F., Matsika, E., 2006, *Bio-energy trade and regional development: the case of bio-ethanol in southern Africa*, available at: <http://www.sei-international.net/mediamanager/documents/Publications/Climate/southernafriabcioethanol.pdf>
- [17] Nairobi Framework partners, 2010, *Africa Carbon Forum*, available at:
<http://africacarbonforum.com/2009/english/objective.htm>
- [18] Orbeo, 2010, *How to manage the risk and value of your CDM portfolio?*, available at:
http://www.carbonexpo.de/global/dokumente/carbon_expo/en/conference_programm/260510_Training2_0830_Manuel.pdf
- [19] Regional Trade Facilitation Programme, 2007, *Inventory of regional non-tariff barriers: synthesis report*, available at: ntb.africonnect.com/media/ntb_synthesis_2007_final.pdf
- [20] Standard&Poor's, 2010, *Role of Multilateral Development Banks in Delivering Climate Finance*, available at:
http://www.carbonexpo.de/global/dokumente/carbon_expo/en/conference_programm/270510_Finance_1200_Mike-Wilkins.pdf

[21] The Carbon Rating Agency, 2010, *Carbon Offset Risk Estimation and Management under the CDM*, available at:
http://www.carbonexpo.de/global/dokumente/carbon_expo/en/conference_programm/260510_Training2_0830_Rajan.pdf

[22] The World Bank, *BioCarbon Fund*, available at:
<http://wbcarbonfinance.org/Router.cfm?Page=BioCF&FID=9708&ItemID=9708>, accessed August 2010

[23] UNEP, *African Carbon Asset Development (ACAD) Facility*, available at:
<http://www.unep.fr/energy/activities/acad/pdf/ACAD.pdf>

[24] UNEP, 2010, *Scaling up Climate Financing*, available at:
http://www.carbonexpo.de/global/dokumente/carbon_expo/en/conference_programm/270510_Finance_1045_Hodes.pdf

[25] UNEP Risø Centre, 2010, *CDM Green Facility*, available at: <http://uneprisoe.org/greenfacility/>

[26] UNDP, UNEP, UNEP RISO Centre, 2010, *Bio-Carbon Opportunities in Eastern & Southern Africa*, available at: <http://www.undp.org/climatechange/carbon-finance/Docs/Bio-carbon%20in%20Africa%20-%20harnessing%20carbon%20finance%20for%20forestry%20and%20bio-energy.pdf>

[27] UNFCCC, 2010, *CDM Statistics – Projects by region*, available at
<http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByRegionPieChart.html>

[28] Wetlands International, 2008, *Biofuels in Africa – An assessment of risks and benefits for African wetlands*, available at
http://www.unido.org/fileadmin/user_media/UNIDO_Header_Site/Subsites/Green_Industry_Asia_Conference__Maanila_/GC13/Wetlands.pdf

[29] Winona National Bank, *The 7 Stages of the Business Life Cycle*, available at
<http://www.winonanationalbank.com/BusinessBanking/BusinessLifeCycle.aspx>, accessed September 2010

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