



Executive Summary

Capacity Needs Assessment for Grid-Connected Bioenergy Development in Viet Nam (Biomass, Biogas and Waste to Energy)

Bản quyền thuộc về:

Dự án Hỗ trợ Năng lượng tái tạo GIZ-GDE/MOIT

Nội dung:

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Viet Nam (Biomass, Biogas and Waste to Energy)**

Summary

Renewable energy (RE) and bioenergy in particular are increasingly becoming one of Vietnam Government's primary concerns. Its target is for electricity generation from RE to contribute 4.5% of total power generation in 2020 and 6% in 2030. Due to insufficient supporting policies, other economic, financial, institutional and technical barriers, as well as limited awareness, the grid-connected bioenergy sector still has made little progress and needs further capacity development in terms of technologies, knowledge and finance, etc. The study 'Capacity needs assessment for grid-connected bioenergy development in Viet Nam (biomass, biogas and waste to energy)' undertaken by GIZ and MOIT is an attempt to promote the sector. As a result, recommendations for capacity development were made in five core areas and involve a variety of stakeholders:

Figure 1: Five core areas of stakeholder involvement



The existing and required capacities as well as the capacity gaps of different stakeholders were identified at organisational and individual level. Short- and medium-term measures for improvement were then proposed for each core area.

Key short-term recommendations include improving capacity in a range of areas such as technology, project management skills, training curriculum development, equipment and international cooperation in research, training, and technology transfer.

Medium-term recommendations emphasise the necessity for a good information and communication system for RE as well as the establishment of a technology transfer centre and capacity-building programmes.

These measures will support all involved stakeholders and help to upgrade the capacity of all responsible staff. Without a doubt, the successful implementation of those strategies for capacity improvement in the grid-connected bioenergy sector requires close collaboration among stakeholders as well as the effective coordination of MOIT centrally and locally.

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ABBREVIATIONS

EPC	Engineering, Procurement and Construction
EPTC	Electric Power Trading Company (under EVN)
FIT	feed-in tariff
GO	Government Office
NGO	non-governmental organisation
ODA	official development assistance
PC	People's Committee
PDP	Power Development Plan
PPA	power purchase agreement
RE	renewable energy
SWOT	strengths, weaknesses, opportunities and threats
VGGS	Viet Nam Green Growth Strategy

Extended group of stakeholders

ADB	Asian Development Bank
AECID	Spanish Agency for International Cooperation and Development
AFU HCM	HCMC Agriculture and Forestry University
AI-MOC	Administration of Infrastructure – Ministry of Construction
CCO-MONRE	Climate Change Office – Ministry of Natural Resources and Environment
CEMRT-ERAV	Center for Electricity Market Research and Training - ERAV
COP-MONRE	Center of Ozone Protection – Ministry of Natural Resources and Environment
DARD-CT	Provincial Department of Agriculture and Rural Development (Can Tho People's Committee)
DC-MARD	Department of Crops – Ministry of Agriculture and Rural Development
DCT-AFU HCM	Department of Chemical Technology - HCMC Agriculture and Forestry University
DDP-VDB	Division of Development Policies – Vietnam Development Bank
DEM-DNU	Department of Equipment Management – Da Nang University
DIE-MPI	Department of Industrial Economics – Ministry of Planning and Investment
DL-MARD	Department of Livestock - Ministry of Agriculture and Rural Development
DOIT-HCMC	Department of Industry and Trade – Ho Chi Minh City PC
DOIT-BD	Department of Industry and Trade – Binh Duong PC
DOIT-CT	Department of Industry and Trade – Can Tho PC

DOIT-DN	Department of Industry and Trade – Da Nang PC
DOIT-HP	Department of Industry and Trade – Hai Phong PC
DOST	Department of Science and Technology
DOST-BD	Department of Science and Technology – Binh Duong PC
DOST-CT	Departments of Science and Technology – Can Tho PC
DOST-DN	Department of Science and Technology – Da Nang PC
DOST-HCMC	Department of Science and Technology – Ho Chi Minh City PC
DOST-HP	Department of Science and Technology – Hai Phong PC
DPI	Department of Planning and Investment
DSENRE-MPI	Department of Science, Education and Natural Resources and Environment – Ministry of Investment and Planning
FDE-MOF	Financial Department for Enterprises - Ministry of Finance
FE-CTU	Faculty of Environment – Can Tho University
FE-UNRE HCM	Faculty of Environment – Ho Chi Minh University of Environment and Natural Resources
FF-CTU	Faculty of Fisheries – Can Tho University
FMT-AFU HCMC University	Faculty of Mechanics and Technology – Ho Chi Minh City Agriculture and Forestry University
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GIZ- TVET	Technical and Vocational Education and Training Programme Viet Nam – GIZ
GIZ-RESP	Support for the Development of Renewable Energy in Viet Nam Project – GIZ
GREEN-ID	Green Innovation and Development Center
HE-MOET	Higher Education Department – Ministry of Education and Training
IES	Institute of Energy Sciences
IPSARD	Institute of Policy and Strategy for Agriculture and Rural Development
IPSI	Industrial Policy and Strategy Institute
ISPONRE	Institute of Strategy and Policy for Natural Resources and Environment
NRED-MOIT	New and Renewable Energy Department – Ministry of Industry and Trade
PED-MOET	Professional Education Department – Ministry of Education and Training
PMU-VBL-MARD	Project Management Unit – Viet Nam Biogas Livestock Sector – Ministry of Agriculture and Rural Development
SDCC	Sustainable Development and Climate Change Consultancy Company
SHEER-HUST	School of Heat Engineering and Refrigeration – Hanoi University of Sciences and Technologies
SIDA	Swedish International Development Cooperation Agency
SNV	Netherlands Development Organisation
SONG HONG	Song Hong Joint Stock Company
USAID	United States Agency for International Development
VBA	Vietnam Biogas Association
VEA-MONRE	Vietnam Environment Administration – Ministry of Natural Resources and Environment

VSA	Viet Nam Sugar Association
VSCs	Viet Nam Sugar Companies
	World Bank

Core stakeholders as listed under 3.1 (Overview of stakeholders by core areas)

AGU	An Giang University
AGVT	An Giang Vocational Training College
AIT	Asian Institute of Technology
AIT-VN	Asian Institute of Technology in Vietnam
CAMIX	waste and wastewater solutions company
CTU	Can Tho University
DNU	Da Nang University
DARD-CT	Department of Agriculture and Rural Development – Can Tho PC
DOC	Department of Construction
DOIT	Department of Industry and Trade
DONRE	Department of Natural Resources and Environment
ENERTEAM	Energy Conservation Research & Development Center
EPU	Electric Power University
ERAV	Electricity Regulation Authority of Vietnam
EVN	Vietnam Electricity Group
GDE-MOIT	General Directorate of Energy – Ministry of Industry and Trade
GMGC	Gold Millennium Group Consulting
HCMC-VC	Ho Chi Minh City Electricity Vocational College
HNHB Group	Hoai Nam Hoai Bac Group
HUST Hanoi	Hanoi University of Sciences and Technologies
HUST HCM	Ho Chi Minh University of Science and Technology
ICF	IndoChina Capital Fund
IOE	Institute of Energy
IMST	Institute of Mining Science Technologies
IPSI	Industrial Policy and Strategy Institute
MARD	Ministry of Agriculture and Rural Development
MOC	Ministry of Construction
MOET	Ministry of Education and Training
MOF	Ministry of Finance
MONRE	Ministry of Natural Resources and Environment
MOLISA	Ministry of Labour, Invalids and Social Affairs
MOST	Ministry of Science and Technology
MPI	Ministry of Planning and Investment
NTU	Nha Trang University
PECC3	Power Engineering Consulting Joint Stock Company 3
RCEE-NIRAS	Research Center for Energy and Environment – NIRAS
THIC	Tuy Hoa Industrial College
UNRE HCMC	Ho Chi Minh City University of Environment and Natural Resources
URENCO	Urban Environment Company
USTH	University of Science and Technology of Hanoi
STAMEQ	Directorate of Standards, Metrology and Quality
VAST	Vietnam Academy of Science and Technology
VDB	Vietnam Development Bank
TRANSERCO	Transport Service Corporation
BWTE	Biology Energy-Waste Treatment Company Ltd
VEPFMONRE	Vietnam Environment Protection Fund
VLU	Van Lang University
VNU	Vietnam National University



01

1. Rationale of the study

1.1. Objectives and scope of the study

The development of renewable energy (RE) holds good promise in improving Viet Nam's national power supply and its general socio-economic development. RE-related targets have been integrated in a range of different national target programmes of the Government of Viet Nam starting with 2008's National Target Program for Responding to Climate Change, 2007's National Energy Development Strategy, 2011's National Climate Change Strategy, and 2012's Viet Nam Green Growth Strategy (VGGS).

Incentive mechanisms such as feed-in tariff (FIT) rates for biomass and waste power projects, tax reductions for imported/exported equipment and materials, and financial support for those projects were introduced by the government in 2014. In order to lay a good foundation for bioenergy sector promotion and its strategic planning, the Ministry of Industry and Trade (MOIT) and GIZ worked together on the 'Capacity Needs Assessment Study for the Grid-connected Bio-energy Sector with a Focus on Biomass, Biogas and Municipal Domestic Waste' (hereinafter referred to as 'CNA Study'). AIT-VN was selected to conduct the study. The CNA Study aimed at two major objectives:

- i. assess and determine the existing and required capacities and capacity gaps at institutional and individual level for each core area in the grid-connected bioenergy sector; and
- ii. propose short (up to 2 year) and medium (2-5 years) term recommendations on capacity building for each core area.

The study shall also act as a reference source for relevant units and organisations.

Three areas of grid-connected bioenergy electricity, including biomass, biogas and municipal solid waste, were examined at the organisational and individual capacity level. Recommendations were developed in order to overcome the identified capacity gaps. Involved stakeholders include functional units at MOIT, universities, research institutes, banks, consulting agencies, non-governmental organisations (NGOs), associations and enterprises investing in RE projects.

1.2.Policies and legal framework for the development of renewable energies with a focus on grid-connected bioenergy

Supporting policies on RE development have been adopted by the Government of Viet Nam. Strategies and master plans include the Electricity Law No. 28/2004/QH11 and the Power Development Plan (PDP) No.7, which plan for an RE contribution to total electricity generation of 4.5% in 2020 and 6.0% in 2030. As stated in the PDP No. 7, biomass power shall reach an installed capacity of 500 MW by 2020 and 2000 MW by 2030.

Further decisions and regulations encouraging investment in bioenergy projects include:

- Regulation of avoided cost tariffs and standard PPA for small renewable energy power plants connected to the national grid [MOIT 2008].
- Joint Circular No. 58/2008/TTLT-BTC-BTN&MT dated 4 July 2008 issued by MOF and MONRE explaining the rules of government support for clean energy projects.
- Establishment of the VEPF to support environmental projects like grid-connected bioenergy projects in 2002.
- Two decisions (No. 31/2014/QD-TTg dated 5 May 2014 on the support mechanism for the development of solid waste power projects and No. 24/2014/QD-TTg dated 24 May 2014 on the support mechanism for the development of biomass power projects were issued; these include a set FiT rate and other incentives such as tax exemptions.

In addition, the government receives international financial and technical support in the field of RE, in particular bioenergy. Projects co-implemented by international organisations include the GIZ Renewable Energy Support (RESP) Project which focuses on the improvement of the legal framework and mechanisms for bioenergy projects, the World Bank Energy Sector Management Assistance Programme, which aims to map biomass resources, and projects by other donors in the broader field of RE including SNV Netherlands Development Organisation, the EU Delegation, USAID, ADB, AECID, etc.

1.3.Current status of grid-connected bioenergy generation

Biomass

Biomass resources are abundant, ranging from agricultural waste, straw, husk, bagasse, wood and wood waste to peanut shells and coconut and cashew waste. The potential electricity generation capacity of these sources is about 2,500 MW [Cuong 2011a]. At present, electricity production from biomass only makes up approximately 150 MW out of 21,500 MW of total installed capacity in 2010. Consumption of biomass energy mostly limited to cooking and heating purposes.

Potential grid-connected biomass power projects include 41 sugar mills with an estimated capacity of 500 MW; 6 grid-connected plants using bagasse electricity technology with a total capacity of 150 MW are currently installed. Other projects include small-scale pilot facilities, with inefficient operation and out-of-date equipment which are not connected to the grid. Therefore, there should be further mechanisms to alleviate these constraints in order to meet the Vietnamese Government targets outlined in the PDP No. 7.

Biogas

With various sources from food and crop processing as well as domestic animals, biogas electricity projects are mainly small-scale (e.g. 200,000 household-scale biogas projects in 53 rural and mountainous provinces) and not grid-connected. The main objective is to provide cooking gas to households, meet the internal power demand, and increase environmental protection, for example in wastewater treatment. There is only one 2-MW industrial-scale biogas plant utilizing pig manure, which faces the problem of gas being unused and accordingly flared off without making proper use of this energy. Popular technologies employed are restricted to small-scale biogas digesters and biogas storage bags.

Waste

Twenty-eight million tons of solid waste, 70% domestic and 30% industrial, construction, medical or other residues, are generated annually [VEA, 2009]. Waste treatment technology is of low standard, such as poorly operated landfills, open burning or simply dumping waste into rivers, canals or fields. Some projects have been developed to promote grid-connected bioenergy power. For example, the Go Cat waste-to-energy electricity plant in Ho Chi Minh City with 2.4 MW of installed capacity, a Japanese funded waste-to-energy project at Nam Son landfill, is expected to become operational in 2014. This market of investment still has limitations, including high investment cost, economic inefficiency and inadequate FiTs.



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2. Methodology

2.1. Study method

The ‘Capacity Development Needs Diagnostics for Renewable Energy (CADRE)’ methodology¹ was employed to identify: (1) capacity needs of the grid-connected bioenergy sector; (2) existing capacities; and (3) capacity gaps.

The **target model** for the grid-connected bio-energy sector was constructed to detail these three elements. The basic target model is composed of (1) core areas of the sector including legal frameworks, regulation and administration, human resources, investment, equipment and services provision, project development and operation; and (2) applications and processes for each core area. The following table summarises the methodological steps.

Study method	Content and tasks
Step 1: Identification of the scope of the study	SWOT (strengths, weakness, opportunities and threats) analysis of each core area (in a kick-off and scoping workshop) and completion of: (1) basic target model incl. 5 core areas and related processes/applications; (2) stakeholder landscape for 5 core areas; (3) arrangement of the participation of the key organisations in the study.
Step 2: Data collection	Collection of data on the capacity needs of participating stakeholders via interviews and questionnaire sheets including information on: (1) organisation’s mission; (2) organisation’s current capacity; (3) relationship among stakeholders; (4) organisation’s solutions to improve capacity at organisational and individual levels.

¹ The CADRE methodology was developed by GIZ and applied in many countries.

Step 3: Data analysis	<p>Preparation of an analysis summary including the identification of:</p> <ol style="list-style-type: none"> (1) organisation's status, mandates, responsibilities and activities related to grid-connected bioenergy; (2) existing capacities; (3) required capacities at the organisational level; (4) organisational capacity gaps; (5) individual capacity gaps; (6) solutions and recommendations from the interviewee's perspectives. <p>This information was integrated into the basic target model.</p>
synthesis	<ol style="list-style-type: none"> (3) organisational capacity gaps; (4) Existing individual capacities; (5) Required capacities at the individual level; (6) Individual capacity gaps. <p>Recommendations for capacity development were formulated for each core area at organisational and individual levels for a short and medium-term period.</p>

2.2. Overview of target model

The target model was developed based on the following five core areas:

1. Capacities to create a favorable development framework for grid-connected bioenergy

2. Capacities to regulate and administer the sector

3. Capacities to develop human resources

4. Capacities to provide equipment and services for grid-connected bioenergy projects

5. Capacities to develop, plan, build, operate and maintain grid-connected bioenergy projects

Core area 1: To create a favourable development framework for RE (focus on biomass, biogas and waste-to-energy)

Activities include:

- i. *development of strategies and plans* related to bioenergy, such as the Power Development Plan (2011), regional RE development plans such as the National Energy Development Strategy (2007), etc. (involved organisations: MOIT/GDE, MPI, MOF, MOET, MONRE, MOC);
- ii. *development of policies and support mechanisms* to encourage foreign/ODA/private investment in grid-connected bioenergy projects (involved organisations: MOF, MPI, MOIT/GDE);
- iii. *development of national target programmes* such as RE national target programmes including on bioenergy development and specific RE types (e.g. biomass, biogas, waste-to-energy); integration of RE use in key national programmes like the National Energy Efficiency Program, rural electrification, afforestation, poverty alleviation, VGGS, etc.;

- iv. *development of financing options* including the development of fiscal mechanisms for RE investment, bioenergy development and the set-up of RE development funds to support potential projects (involved organisations: MOF, MONRE, MOIT/GDE);
- v. *development and introduction of technologies* including the development of technological applications of grid-connected bioenergy and research on RE; tax incentives and reductions for equipment import, and protection of patents for inventions and technical improvements (involved organisations: MOST, MOIT).
- vi. *implementation of strategies and policies, which involves:*
 - a. coordination of activities in bioenergy project licensing and guideline development (Involved organisations: MOIT/GDE, provincial/municipal People's Committees (PCs));
 - b. support for investors with regard to resident's compensation, site clearance, infrastructure, human resource development, etc.; monitoring of bio-energy projects, and management of local electricity-related activities in conformity with current legislation (involved organisations: district PCs, regional electricity unit, commune authorities, DOIT);
- vii. *human resources development:* Establishment of a national programme for human resources in RE; development of an RE major in higher education and vocational training institutes/colleges (involved organisations: MOET and GDE/MOIT, see further organisations under core area 3)

Core area 2: To regulate and administer the sector

Activities include:

- i. support activities for RE and grid-connected bioenergy projects including the issuance of standard power purchasing agreements (PPAs) and technical standards for grid-connected biogas, biomass and waste-to-energy; development and upgrade of power transmission lines, implement governmental decisions and circulars on support mechanisms for grid connected bioenergy including FiTs, licenses, funding, loans for grid-connected bio-energy projects (involved organisations: ERAV, EVN, MOST/STAMEQ, MONRE/VEPF);
- ii. planning and supplying of RE electricity (bioenergy) to rural areas and islands (involved organisations: EVN, ERAV).

Core area 3: To develop human resources

Activities include:

- i. upgrade of organisational and individual capacities (qualifications, technical skills) for those who are involved in grid-connected bioenergy development (involved organisations: MOET, MOIT/GDE, Ministry of Labour, Invalids and Social Affairs (MOLISA), MOIT, MARD, MOC, MONRE, MOST and related PC departments of PCs).
- ii. strengthening of scientific research activities including infrastructure facilities, training programmes, the application of new technologies in the fields of biomass, biogas and waste-to-energy (involved organisations: universities, vocational training institutions, research institutes, consulting firms (see detailed list under 3.1)).

Core area 4: To provide equipment and services for bioenergy projects

Activities include:

- i. adaptations of technologies for local manufacturing, assembly, repair and maintenance of bioenergy equipment; engineering, procurement and construction (EPC) services (involved organisations: manufacturing and service companies, consulting and construction companies (see detailed list under 3.1);
- ii. provision of capital and financial management services; establishment of networks and cooperation activities in bioenergy.

Core area 5: To develop, plan, build, operate and maintain bioenergy projects

Activities cover different aspects: funding, project development and implementation (including equipment purchase and service management), management and operation of bioenergy power plants (involved organisations: investors, project developers, professional consulting companies, construction companies, EPCs (see detailed list under 3.1).

2.3. Timeframe of the study

The target model was developed based on the following five core areas:

Table 2: Timeframe of the study

Timeframe	Participants	Outcome
Stage I: Identification of the study scope		
1 to 31 May 2013	International consultant, GIZ RESP team, AIT-VN local consulting team	Basic target model: (1) core areas with accompanying processes and applications (2) map of stakeholders in the grid-connected bioenergy sector (3) list of main stakeholders in the study
Stage II: Data collection		
1 June to 30 August 2013	- 67 organisations and stakeholders in five core areas in Hanoi, HCMC, Hai Phong, Da Nang and Can Tho (interviews) - 81 governmental officers, experts, engineers and consultants, project developers, researchers with background related to grid-connected bioenergy (questionnaire)	(1) interview transcripts (2) statistical analysis of capacity needs at individual levels (See Annex 2 and Annex 3 in long version)
Stage III: Analysis and synthesis of collected data		
1 September to 30 December 2013	Local consulting team, GIZ office and international consultant	(1) identified capacity gaps at organisational and individual levels for each participating organisation; together with solutions and recommended measures (2) proposal of recommendations for each core area in a short-term period (up to 2 years) and medium-term period (3–5 years)

2.4. Stakeholder map

The stakeholder map illustrates a range of organisations involved in the grid-connected bioenergy sector within the five core areas. In the centre are organisations of high importance.

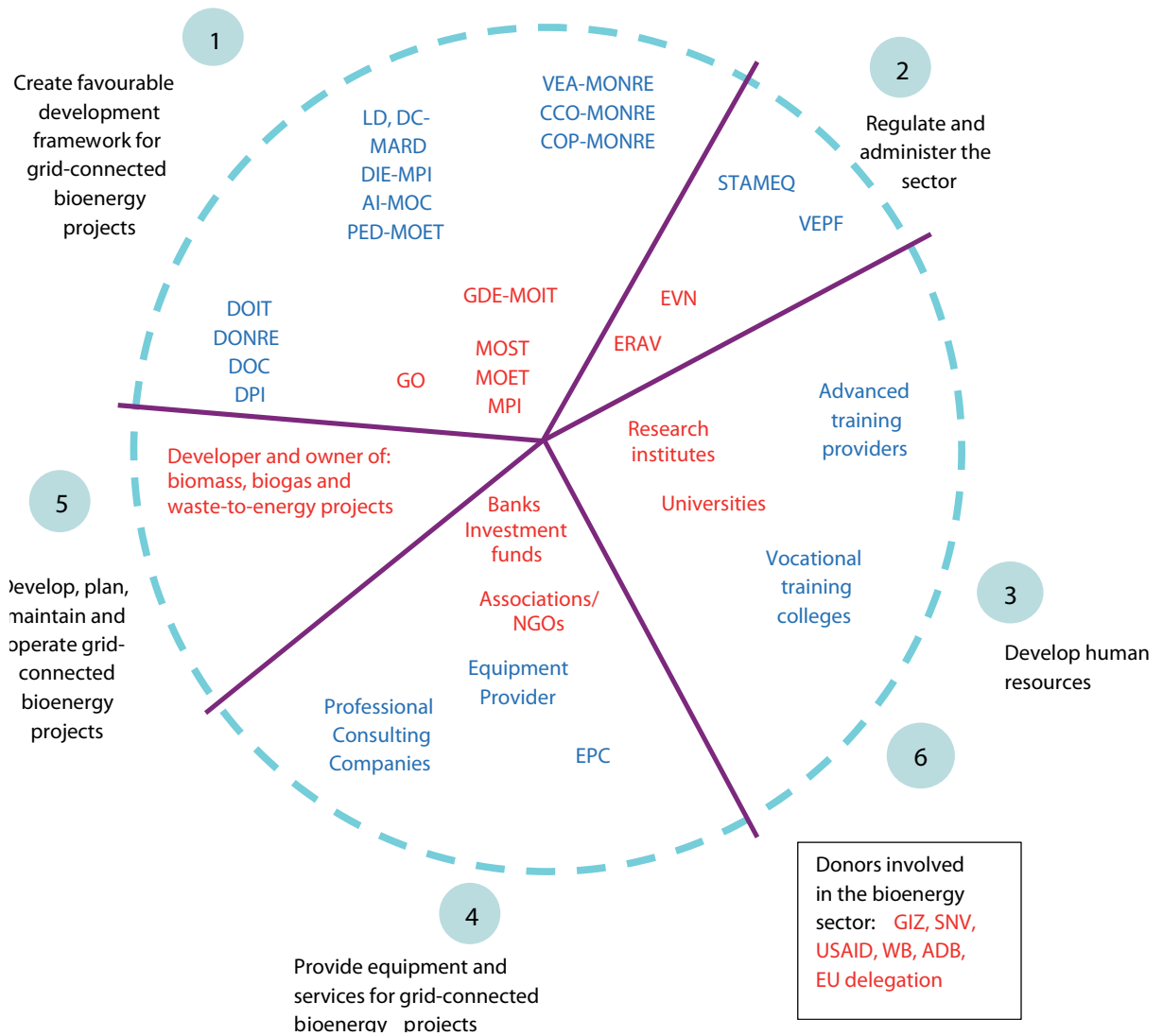


Figure 2: Stakeholder map of grid-connected bioenergy sector



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3. Presentation of the results

3.1. Overview of stakeholders by core area

Core area 1: Create a favourable development framework for grid-connected bioenergy

Stakeholder type	National level	Provincial level
Decision-maker role (highest responsibility)	GDE-MOIT (policy and legal framework development; support mechanisms for RE projects; state-led grid-connected bioenergy planning; approval of RE projects >30MW installed capacity)	Provincial and municipal PCs (implement policies and supporting mechanisms as well as a local supporting framework for grid-connected bioenergy; approval of local grid-connected projects < 30MW installed capacity)
Advisory role	MPI, MOF, MONRE, MOSTE, MARD, MOET, MOC	DOIT, DOC, DONRE, DARD

Core area 2: Regulation and administration connected bioenergy

Stakeholder	Responsibility
Electricity Regulatory Authority of Vietnam (ERAV)	Regulation and monitoring of the electrical grid, setup and development of the electricity market, licensing for national grid-connected bioenergy projects, assurance of grid stability, standards for grid-connected RE electricity, PPA
Electricity of Vietnam (EVN)	Provision of transmission lines, integration of bioenergy projects to the national grid, RE project connection to the grid, signing of PPA
Vietnam Environmental Protection Fund (VEPF)	Financial resources for environmental protection projects and activities; financial norms and standards to support those projects, including grid-connected bioenergy.
Directorate of Standards, Metrology and Quality (STAMEQ)	Governmental agency under MOST having responsibility for advising in the fields of standardisation, metrology and quality within the framework of the development of national policies, strategies and master plans

Core area 3: Develop human resources

Stakeholder	Responsibility
Research institutes	Basic and adaptive research, advanced technology transfer, drafting policies, development strategies and incentive mechanisms for the grid-connected bioenergy sector Relevant organisations: IOE, IPSI, IMST, AIT technical and consulting companies (see core area 4 below), etc.
Universities	Undergraduate and postgraduate training in RE technologies (including grid-connected bioenergy) and RE-focused economics & business administration Relevant universities: AGU, CTU, DNU, NTU, HUST, HUST-HCM, VNU, EPU, UNRE HCMC, USTH, VLU, VAST
Advanced training providers	Short-term training, longer capacity-building programmes in RE, professional skills such as preparation of technical and financial proposals for grid-connected bioenergy investment, RE strategies, bioenergy planning, project monitoring. There is still no advanced training for RE within Viet Nam
Vocational Training Colleges	Education of technicians, skilled workers in RE technologies (focusing on equipment, operation and maintenance in bioenergy plants). Up to now, no vocational training schools offer training on RE-related topics. Relevant colleges: AGVT, HCMC-VC, THIC, etc.

Core area 4: Provide equipment and services to grid-connected bioenergy projects

Stakeholder	Responsibility
Equipment provider	Production of selected accessories, materials, technology transfer, equipment, replacement items, plant construction and maintenance. Relevant organisations: HNHB Group, Dinh Hai Equipment Ltd, Dai Phat Machinery Ltd., Minh Tu Ltd, etc.
Engineering, procurement and construction (EPC)	Technical design, equipment procurement, construction, technology transfer, training, maintenance. Relevant organisations: CAMIX, etc.
Professional consulting companies	Technical and financial proposals, assessment of economic efficiency of investment, engineering design, technology transfer, consultation in construction and training in plant management and operation Relevant organisations: PECC3, RCEE-NIRAS, Fichtner Viet Nam Ltd, ENERTEAM, GMGC, technical universities (see above), research institutions (see above), NGOs (see below), etc.
Banks and investment funds	Loans to grid-connected bioenergy projects, assessment of investment efficiency, possible risk and project monitoring Relevant organisations: ICF, VDB, commercial banks, ODA funding
Associations and NGOs	Introduction of new technologies, incentive mechanisms, consultations on project development and implementation, awareness training Relevant organisations: Viet Nam Biogas Association, Viet Nam Sugar Association, Viet Nam Energy Association, Clean Energy Association; Association for Environmental Protection, Green-ID, Live and Learn

Core area 5: Project development and operation

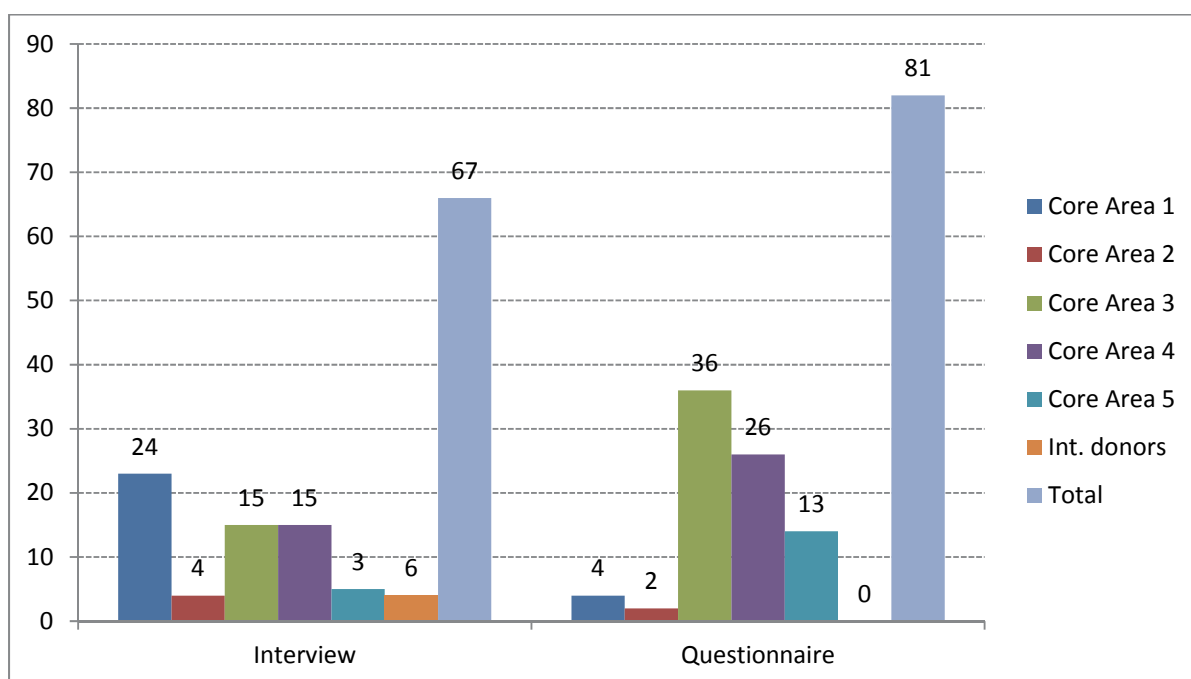
Field	Stakeholders in the field include
Biogas	Local and foreign investors and project developers, large-scale pig, poultry or milk cow farmers Relevant organisations: San Miguel Pure Foods Vietnam Ltd, TNH Truemilk, TRANSERCO, etc.
Biomass	Local and foreign investors, sugar factories Relevant organisations: Lam Son Sugar Cane Joint Stock Company (JSC), Gia Lai Sugar – Thermal Power JSC, Khanh Hoa Sugar JSC, Ninh Hoa Sugar JSC, TTC Group, TRANSERCO, etc.
Waste	Local and foreign investors, state-run urban environment companies Relevant organisations: URENCOs, Hitachi, Nam Son waste-based power plant – funded by Japanese-Vietnamese Green Aid Programme (GAP), Tam Sinh Nghia Investment-Development JSC, Vietnam Waste Solution Inc., BEWTE, etc.

Also active in the bioenergy sector are **donor organisations** including SNV Netherlands Development Organisation, ADB, World Bank, USAID, the EU delegation and GIZ.

3.2. Analysis of stakeholder capacity by core area

The analysis was undertaken via questionnaire-based surveys and interviews. In total, 67 key stakeholders were selected for interview and 81 key stakeholders opted for questionnaires. These key stakeholders were carefully chosen to be representatives of five Core Areas as well as international donors.

Figure 3: Representatives of key stakeholders in five core areas interviewed and questioned



In addition, 27 capacity needs assessment reports of 27 key participating organisations in the study were analysed for **existing capacities, required capacities and capacity gaps** at the organisational and individual level.

Table 3: Existing and required capacities and capacity gaps at organisational level

Core area	Current situation and existing capacities	Required capacities	Capacity gaps
1	<p>Central level:</p> <ul style="list-style-type: none"> - limited staff number in charge of RE - technical staff have limited RE education or specific expertise in grid-connected bioenergy - ineffective management procedures, insufficient coordination - limited experience in policy formulation, project development <p>Local level</p> <ul style="list-style-type: none"> - staff without RE knowledge and specific skills - no responsible staff for RE/grid-connected bioenergy - no guidelines for policy implementation, planning for RE only selectively available - DOIT lack supporting data, tools and methods, and financial and human resources to fulfil the assigned duties, including project evaluation and research planning 	<p>For both central & local level:</p> <ul style="list-style-type: none"> - effective management and coordination of stakeholders - strategy and policy development - implementation and monitoring of national target programmes - project assessment - monitoring and evaluation of grid-connected bioenergy projects - improved communication 	<p>There should be:</p> <ul style="list-style-type: none"> - 3–4 new recruits at Department of New & Renewable Energy under GDE - 1–2 recruits responsible for RE/grid-connected bioenergy at DOIT at central and local level <p>Inadequate experience in:</p> <ul style="list-style-type: none"> - RE potential and project assessment - monitoring and evaluation of grid-connected bioenergy projects <p>Lack of:</p> <ul style="list-style-type: none"> - complete information system for improved flow between central and local units - expertise, tools, data for sharing
2	<ul style="list-style-type: none"> - staff with RE experience at ERAV and VEPF but not with regard to grid-connected bioenergy projects - limited budget for RE capacity building 	<p>VEPF: standards for financial support approval</p> <p>ERAV: evaluation of grid-connected bioenergy projects</p>	<p>budget for bioenergy and related technology training</p>
3	<ul style="list-style-type: none"> - limited staff with intensive bioenergy training from technical universities and research institutions - limited qualified instructors in grid-connected bioenergy - current curricula can only be revised by some instructors and researchers who took part in international RE projects 	<ul style="list-style-type: none"> - laboratories for research and advanced training in grid-connected bioenergy - development and integration of grid-connected bioenergy into the training curricula - technology research and adaptation 	<ul style="list-style-type: none"> - no laboratory for research on grid-connected bioenergy technologies and technology adaptation - lack of budget for fundamental and adaptive research on new technologies - little demand from young scientists for grid-connected bioenergy technologies - shortage of advanced training opportunities for young staff in research institute and universities
4	<p>(1) Construction service companies</p> <ul style="list-style-type: none"> - Services for small- and medium-scale biogas projects with limited technological capacity - Combination of traditional and new technologies, reducing operational costs for investors 	<p>Capacity in:</p> <ul style="list-style-type: none"> - pre-feasibility/ feasibility studies - structure design, construction, management, monitoring and technical-financial evaluation for biogas energy projects 	<ul style="list-style-type: none"> - knowledge and skills in biogas energy projects - expertise in construction design and safety techniques for biogas energy projects - project management and monitoring

4	(2) Professional consulting companies		
	<ul style="list-style-type: none"> - specialization in technology research and replication in biogas - lack of experience in industrial-scale projects and the application of advanced technologies - lack of infrastructure, equipment and laboratories for research in grid-connected bioenergy - experience in foreign-funded projects (landfill gas recovery, waste disposal technology) - employees with solid backgrounds in environmental engineering, not in waste-to-energy techniques 	<p>Capacity in:</p> <ul style="list-style-type: none"> - pre-feasibility/ feasibility studies - preparation of technical and financial proposals - new technology research and application replication - evaluation of economic/ financial efficiency of bioenergy projects - consultation on bioenergy technology and project management 	<ul style="list-style-type: none"> - laboratories for research and development - professionals and experts in grid-connected bioenergy
	(3) Banks and funding agencies		
	<ul style="list-style-type: none"> - staff in charge has financial background and self-studied RE - VDB involved in hydropower and waste investment projects; not in grid-connected bioenergy yet - VDB and IndoChina Capital considers RE investment; staff equipped with bioenergy background but found no relevant training courses in VN 	<ul style="list-style-type: none"> - assessment of economic-financial aspects and bioenergy investment efficiency - assessment of legal issues - management and supervision of grid-connected bioenergy projects - understanding of support mechanisms 	<ul style="list-style-type: none"> - knowledge in grid-connected bioenergy and related technologies - skills in project assessment, evaluation and project investment cost-efficiency
	(4) Associations		
<ul style="list-style-type: none"> - current staff: older with extensive experience and professional knowledge; urgent need for young experts - limited knowledge and skills in grid-connected bagasse or biogas energy; limited budget 	<ul style="list-style-type: none"> - forums, seminars and conference organisation on grid-connected bagasse and biogas energy - consultation on biomass, biogas power technologies, services and training in grid-connected biomass - good knowledge of RE-related strategies and policies 	<p>Lack of:</p> <ul style="list-style-type: none"> - qualified resource staff and experts - budget for advocacy, human resources, R&D 	
5	(5) NGOs		
	<ul style="list-style-type: none"> - staff available with experience working with international experts, household biogas application and energy planning 	<ul style="list-style-type: none"> - understanding of grid-connected bioenergy and related technologies 	<ul style="list-style-type: none"> - general knowledge in grid-connected bioenergy and related technologies
(1) Biogas project developers			
<ul style="list-style-type: none"> - small investors with limited human capacity and investment capital - limited capacity in project management and post-handover operations - limited access to government policies and mechanisms - lack of knowledge on biogas energy and technologies 	<ul style="list-style-type: none"> - management, operation and maintenance of grid-connected biogas energy plants - funds/capital for investment - understanding of technologies and policies in the field 	<p>capital shortage for investment in grid-connected biogas plants and lack of advanced biogas technologies</p>	

5	(2) Biomass project developers		
	<ul style="list-style-type: none"> - sugar companies are the main biomass energy developers with outdated technologies - lack of expert staff on grid-connected bioenergy from bagasse - limited capacity in management and operation of electricity generation equipment 	<ul style="list-style-type: none"> - technical and financial proposal writing - evaluation of economic/ financial effectiveness of projects - management of bagasse projects - operation and maintenance of grid connected bagasse energy projects - understanding of biomass energy and technologies 	<ul style="list-style-type: none"> - out-of-date technologies - lack of modern equipment for biomass energy - lack of capital for investment
	(3) Waste-to-energy project developers		
	<ul style="list-style-type: none"> - URENCOs are potential investors in waste-to-energy - URENCOs lack of professional staff in waste-to-energy processes; no training courses provided up to now 	<ul style="list-style-type: none"> - technical and financial proposal writing - assessment and planning of waste collection/disposal potentials - management and supervision of waste-to-energy projects - understanding of waste-to-energy process and technologies 	<p>Lack of:</p> <ul style="list-style-type: none"> - qualified human resources in the field - advanced technologies in grid-connected waste-to-energy

Table 4: Existing and required capacities as well as capacity gaps at individual level

Core area	Current situation and existing capacities	Required capacities	Capacity gaps
1	Central level		
	<ul style="list-style-type: none"> - responsible staff has no background in RE technologies - management and administration training courses are provided on annual basis, but no training on RE 	<ul style="list-style-type: none"> - strategy/goal/ action plan preparation - drafting of incentives and support mechanisms - coordination and implementation of national target programmes - coordination of information flow among ministries/ stakeholders involved - appraisal of proposals for financial support - monitoring and evaluation of large-scale bioenergy projects - community-based advocacy and education 	<p>*Lack of skills in:</p> <ul style="list-style-type: none"> - managing stakeholders - developing and implementing strategies, action plans, and national and regional RE development plans - developing national target programmes and support packages - writing reports/proposals/ legal documents - assessing policy impact and current situation of bioenergy development - preparing bioenergy standards and regulations - evaluating, supervising and monitoring bioenergy projects <p>*Lack of knowledge on bioenergy technologies and support policies; lesson learned from other countries</p>

<p>1</p>	<p>Local level</p> <p>DOIT: Staff (mainly electrical engineers, power managers and operators) with no background in RE/RE planning, assessment of bioenergy potential and/or RE project monitoring DOST: staff with no experience working in grid-connected bioenergy projects/with foreign experts or consultants; not trained in the field.</p>	<ul style="list-style-type: none"> - Responsible staff need individual capacities in: - preparation of RE development strategies and planning; technical/ financial proposals at provincial level - implementation of supporting policies for grid-connected bioenergy projects - supervising and monitoring grid-connected bioenergy projects - management and coordination of stakeholders and consultants - knowledge of grid-connected bioenergy and related technologies; incentives/policies for biomass, biogas and waste-to-energy projects. 	<ul style="list-style-type: none"> *Lack of skills in: <ul style="list-style-type: none"> - management and coordination of stakeholders - analysis and forecasting of electricity needs and potential bioenergy at provincial level - preparation and implementation of strategies and action plans for the bioenergy subsector - evaluation and monitoring of grid-connected bioenergy projects at provincial level - assessment of investment efficiency - risk management * Lack of knowledge on related technologies and policies in the field
<p>2</p>	<p>ERAV</p> <p>Professional staff with good education (PhD, MSc, etc.), economics and energy engineering backgrounds from HUST and good English skills, but not involved in any bioenergy projects and have not attended any training course in bioenergy</p> <p>VEPF</p> <p>Responsible staff: well-educated with economic/ finance backgrounds, self-studied RE, not involved in bioenergy projects, no opportunities to learn about RE incentives</p>	<p>Ability to:</p> <ul style="list-style-type: none"> - set up technical standards for the integration of grid-connected bioenergy to the grid - research integrated technical solutions - understand RE and the electricity market <p>ability to appraise grid-connected bioenergy projects to obtain funding</p> <ul style="list-style-type: none"> - understanding of RE and technologies/policies for biomass, biogas and waste-to-energy 	<p>N/A (no info on the analysis of individual capacity gaps)</p> <p>*Lack skills in: appraising grid-connected bioenergy projects; estimation of investment cost, preparation of technical guidelines; evaluation of economic efficiency</p> <p>*Lack knowledge on support policies, experiences from developed countries, and relevant bioenergy technologies</p>
<p>3</p>	<p>Research institutes</p> <ul style="list-style-type: none"> - researchers with no background in grid-connected bioenergy - knowledge of grid-connected bioenergy was gained via self-learning and short-term training - good capacity in basic and adaptive research in biogas/biomass and in designing small and medium-scale bioenergy projects - need for professional skills in planning for bioenergy development, calculating FiT, evaluating economic effectiveness, etc. 	<ul style="list-style-type: none"> - basic and applied research and in-depth knowledge of grid-connected bioenergy technologies - teaching and development of curriculum in the field - theory and practice combination 	<p>Lack of capacity in large-scale application research projects; in-depth knowledge of grid-connected bioenergy technologies</p>

<p>3</p>	<p>Universities</p> <ul style="list-style-type: none"> - 2–3 key lecturers at technical universities were trained overseas for Masters or PhDs in RE - 1–2 groups of lecturers in each university transferred technologies related to biogas/ biomass and replicate study models for practice - lecturers participated in international cooperation RE projects 		
<p>4</p>	<p>Construction service companies</p> <ul style="list-style-type: none"> - Lack of capacity in engineering design for large-scale projects and knowledge/background in related technologies; - capacity improved mainly through practical experiences and self-learning; - limited management skills, lack of specialists <p>Professional consulting companies</p> <p>Ability to research and deploy in practice; experience in biogas/biomass small and medium-sized projects; qualified staff</p> <p>Finance-banking services</p> <p>Most staff major in finance and economics and lack knowledge in grid-connected bioenergy and related technologies</p>	<p>Capacity in</p> <ul style="list-style-type: none"> - feasibility assessment, technical design and financial proposals for grid-connected bioenergy projects; - construction supervision, project management, economic evaluation, technology research and transfer 	<p>Lack of capacity in:</p> <ul style="list-style-type: none"> - feasibility assessment, technical design and financial proposals for grid-connected bioenergy projects; - construction supervision, project management, economic evaluation, technology research and transfer
<p>5</p>	<p>Biogas, biomass and waste-to-energy project developers</p> <ul style="list-style-type: none"> - limited knowledge of technologies in RE and grid-connected bioenergy - poor capacity in bioenergy project management and operation - limited understanding of policies and support mechanisms for bio-energy projects - limited technologies related to biogas and biomass waste processing 	<p>Capacity in:</p> <ul style="list-style-type: none"> - assessment of potential bioenergy investments - technical and financial proposal formulation - outsourcing and contractor/ consultant management - project management - capital management - management and operation, evaluation of grid-connected bioenergy plants - understanding of legal formalities and related technologies 	<p>Lack of:</p> <ul style="list-style-type: none"> - capacity to assess investment - capacity in formulating technical-financial proposals - capacity in outsourcing and contractor/ consultant management - capacity in project/ capital management - capacity to evaluate, manage and operate grid-connected bioenergy plants - understanding of legal formalities and related technologies



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4. Recommended capacity development measures

4.1. Organisational level: Short and medium-term recommendations

Table 5: Short and medium-term recommendations for the organisational level

Core area	Short term (up to 2 years)	Medium term (2–5 years)
1. Policy and strategy	<p>(R1): Perform awareness-raising and capacity development on bioenergy policy and mechanisms for centralised and decentralised government units.</p> <p>(R2): Make additional staff for the Department of New and Renewable Energy available through donor support.</p> <p>(R3): Introduce first pilot communication schemes between MOIT and relevant ministries/PCs for the proper implementation of support policies; and develop and maintain an online consultation system.</p> <p>(R4): Recruit staff for grid-connected bioenergy for MOC and MARD; Appoint one staff member in MARD and MOC to coordinate effective cooperation with MOIT, MOC and MARD.</p> <p>(R5): Assign responsible staff for establishing procedures and guidelines on methods for conducting bioenergy planning, assessing current status and potential and predicting electricity needs at local levels.</p>	<p>(R6): Equip the understaffed Department of New and Renewable Energy, which plays a crucial role in establishing legal frameworks and implementing RE master plans, with additional employees.</p> <p>(R7): Establish nation-wide communication schemes between MOIT and relevant ministries/PCs for the proper implementation of support policies; and develop and maintain online consultation system.</p> <p>(R8): Maintain an information system to support stakeholders (managed by MOIT) in making decisions and preparing investment proposals.</p> <p>(R9): Increase and establish media communications on RE, grid-connected bioenergy and its roles in the VGGS via channels in provinces and cities.</p> <p>(R10): Recruit further staff on grid-connected bioenergy for MOC & MARD; increase capacity of staff in MARD & MOC responsible for coordinating effective cooperation with MOIT, MOC & MARD.</p> <p>(R11): Further develop the capacities of responsible staff with regard to bioenergy planning, assessment of current status and potential and prediction of electricity needs at local level.</p>

2.Regulation and Administration	No recommendations (but partly covered within other recommendations)	(R12): Strengthen capacity in the management of grid-connected bioenergy for core staff of ERAV and EVN.
3. Human Resources	(R13): Enhance international cooperation among universities, research institutes and international organisations, e.g. in the form of joint programmes in researching new technologies in biogas and biomass; joint training programmes in HUST, HCMC UT and other universities; exchange programme in technology transfer in IOE; international conferences on grid-connected bioenergy; and faculty exchange programmes in key technical universities. (R14): Integrate biomass and biogas training in university curriculums. (R15): Organize annual conferences, expert seminars and forums supported by the Government/donors to exchange ideas and experiences in bioenergy sector.	(R16): Train high qualified candidates already holding a Doctor degree in RE for research institutions and technical universities. (R17): Teach RE, including bioenergy, in selected universities over the next three years. (R18) & (R19): Invest in facilities and laboratories related to biogas, biomass and waste-to-energy technologies at universities such as HUST, HCM UT, Nong Lam University and HUA, as well as at selected research institutions. (R20): Establish a National Professional Training Center on RE, including grid-connected bioenergy, for developing RE human resources and cooperating with national and international universities/institutes.
4 Equipment and services	No recommendations (but partly covered within other recommendations).	(R21): Invest in facilities and laboratories (related to biogas, biomass and municipal domestic waste technologies) for research centres and professional consulting companies (HUST, HCMC UT, UNRE-HCMC, IOE, IES, etc.).
5 Project development and operation	(R22): Upgrade related technologies in sugar factories which have already installed heat/power generation equipment.	(R23): Establish a Central Technology Transfer Center in DARD & MARD for biogas and biomass technology transfer as well as training for communities.

4.2. Individual level: Short and medium-term recommendations

Table 6: Short and medium-term recommendations for individual level

Core area	Short term (up to 2 years)	Medium term (2 to 5 years)
1. Policy and strategy	(R1): Capacity-building programme (phase I) for MOIT-responsible staff including (1) capacity building in developing and implementing RE strategies; (2) an introductory course on grid-connected bioenergy and related advanced technologies; (3) management skills training; and (4) professional skills training to develop support mechanisms for grid-connected bioenergy. (R2): Enhance knowledge on supporting policies/mechanisms and relevant technologies for responsible staff of ministries and provinces who contribute directly to the RE development strategy of Viet Nam; and design training programme to enhance knowledge and skills related to grid-connected bioenergy and relevant technologies for staff from MPI, MOF, MONRE, MOC, MOET, MOST and related provincial departments.	(R3): Capacity-building programme (phase II) for responsible staff at MOIT imparts skills on (1) national and regional bioenergy planning; (2) technical standards for biomass, biogas and waste-to-energy projects; (3) assessment of grid-connected bioenergy projects; and (4) monitoring and evaluation of these projects. (R4) & (R5): Enhance individual capacity of the responsible staff of MARD, DARD, Centers of Agriculture Training in provinces, MOC, DOC in provinces with regard to (1) an overview of bioenergy and related technologies; (2) an overview of support mechanisms and incentives for bioenergy; (3) planning related to biogas, biomass and municipal waste resources.

2. Regulation and administration	<p>(R6): Overview for responsible staff at ERAV, EPTC-EVN on (1) RE and grid-connected bioenergy; and (2) electricity generation technologies and standards for the power network integration of bioenergy projects.</p> <p>(R7): Overview for responsible staff at investment funds, commercial banks and VEPF on (1) RE, biogas, biomass and waste-to-energy technologies; (2) policies, incentive mechanisms and fund process for grid-connected bioenergy projects.</p>	<p>(R8): Business administration training in bioenergy for core staff in relevant units (ERAV, EPTC, DOIT, etc.)</p>
3. Human resources	<p>(R9): Upgrade capacities of selected researchers and instructors at technical universities and institutions on (1) grid-connected bioenergy and related technologies; (2) biogas, biomass and waste-to-energy technologies; and (4) curriculum-development skills and RE training.</p>	<p>(R10): Elaborate a national target programme to build up a group of strong experts and professionals in the field with international certificates.</p>
4. Equipment and Services	<p>(R11): Capacity-building programme for civil engineers in (1) advanced biogas technologies; (2) construction engineering design for large-scale biogas projects; (3) structure and construction techniques; and (4) safety techniques.</p> <p>(R12): Enhance individual capacity of key technical consultants in grid-connected bioenergy projects.</p> <p>(R13): Enhance capacities of responsible staff at selected commercial banks and investment funds on (1) grid-connected bioenergy and related technologies; (2) assessment of those projects; (3) business models in grid-connected bioenergy; and (4) project monitoring.</p>	<p>(R14): Project management courses for professional consulting and construction companies.</p> <p>(R15): Develop the capacity of responsible staff from VSA, VBA and other associations as well as NGOs on (1) promotion skills; (2) advanced biomass technologies; (3) technical and financial proposals for grid-connected bioenergy project investment; and (4) voice of associations and NGOs in policymaking.</p>
5. Project development and operation	<p>(R16): Capacity-building programme (phase I) on (1) understanding of grid-connected biogas energy; (2) overview of grid-connected biogas; and (3) development of technical and financial proposals for investment in the field.</p> <p>(R17): Capacity-building programme for urban environmental companies focusing on grid-connected waste-to-energy technologies and the development/management of those projects.</p> <p>(R18): Capacity-building programme for potential sugar companies focusing on (1) cogeneration technologies in sugar companies; (2) calculation of bagasse energy price per kw; and (3) assessment of project effectiveness.</p>	<p>(R19): Capacity-building programme (phase II) for biogas project developers on the assessment of economic and financial aspects of those projects; project management skills; and operation/maintenance skills.</p> <p>Training needs assessments for each target group of participants</p>



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5. Conclusions

Bioenergy has great potential for power generation and a positive impact on the environment and living conditions of communities. It should be of first priority to have a synchronised and systematic development of human resources at central and local levels for the sustainable development of this sector.

Capacity development measures are crucial to promote RE development. Close cooperation of all stakeholders in the sector is important in order to (1) introduce regulating policies; (2) promote innovation; (3) develop high-quality human resources; and (4) strengthen science and technology. Those four pillars shall help to build up a sustainable grid-connected bioenergy sector in the future.