NAMA Design and Preparation: Consultation on Selecting Priority NAMAs for Lebanon

May 22, 2013
Beirut, Lebanon

Summary Report
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Overview
The national workshop\(^1\) on “Nationally Appropriate Mitigation Action Design and Preparation: Consultation on Selecting Priority NAMAs for Lebanon” was held on May 22, 2013 in Beirut, Lebanon, by the Lebanese Ministry of Environment (MoE) and the United Nations Development Programme (UNDP), supported by the International Partnership on Mitigation and MRV, and KPMG. The workshop took place within the framework of the Low-Emission Capacity Building Project (LECB) in Lebanon.

The workshop allowed experts and stakeholders\(^2\) from public and private institutions as well as the academic sector, to get acquainted to the concept of NAMAs, requirements under the NAMA Registry, available funding sources, a case-study on NAMA development and an overview of the various mitigation options locally identified as a first NAMA list.

The one-day workshop was based on an approach combining theory and practical case-study. The first part featured a conceptual overview of NAMAs, focusing on the required steps to develop a NAMA and opportunities for implementing them. In the second part of the workshop, the proposed selection criteria were presented, with feedback from the stakeholders. Following which, 13 NAMA ideas, developed by various national entities were presented and discussed. The originally planned prioritization exercise was not done, in order to give more time in the discussion of the selection criteria. The workshop resulted in the addition of two “requirement criteria” that would make the NAMAs eligible, followed by another 2 criteria added on the proposed selection criteria.

Objectives of the workshop
- To serve as a learning exercise of a process that will be conducted periodically in Lebanon (Review of NAMA-ideas) – capacity building of the relevant stakeholders
- To understand the national process and the approach used in moving the NAMA portfolio forward
- To validate the selection criteria proposed by the Ministry of Environment
- To showcase the first group of identified NAMA ideas and discuss the way forward

National Policy Context for the development of NAMAs in Lebanon
- 1993: Establishment of the Ministry of Environment
- 1999: Submission of the Initial National Communication to the UNFCCC
- 2002: Promulgation of Law 444 (Protection of the Environment)
- 2003: Preparation of the 1\(^{st}\) Technology Needs Assessment
- 2006: Ratification of the Kyoto Protocol

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\(^1\) Agenda in annex 1.
\(^2\) List of Attendees is attached in Annex 2.
• 2007: Designation of the Ministry of Environment as the Designated National Authority for the Clean Development Mechanism under the Kyoto Protocol³
• 2009: Voluntary commitment of 12% renewable energy by 2020
• 2010: Approval of the Policy Paper of the Energy Sector developed by the Ministry of Energy and Water (including 12% target by 2020)
• 2011: Submission of the Second National Communication to the UNFCCC
• 2011: Approval of the National Energy Efficiency Action Plan
• 2012: Preparation of the 2nd Technology Needs Assessment
• 2012: Establishment of the National Council for the Environment
• 2013: Designation of the Ministry of Environment as the National Coordinator of the Nationally Appropriate Mitigation Actions
• 2013: Decision 99/1 on Guidelines for GHG Reporting

Coordination by the Ministry of Environment to promote low emission development in Lebanon
The Ministry of Environment, with funding from the Lebanon Recovery Fund, has established a climate change coordinating unit under the pseudonym of “The National Action Programme to Mainstream Climate Change into Lebanon’s Development Agenda”. Overall, this project will pave the way for a national Low Emission Climate Resilient Economy, by providing directives through the elaboration of national low emission climate resilient development strategies, and by mainstreaming climate change concepts and tools into national and sector development plans and by developing pilot projects and initiatives. Through the National Council for the Environment, the unit will coordinate and involve the various ministries in a high-level discussion on climate change, encompassing NAMAs, and study the appropriate multiple instruments for climate change finance, including market based instruments, grants or concessional finance and fiscal instruments, in close coordination with the Ministry of Finance.

Workshop Proceedings⁴
Following the welcoming note delivered by the representatives of the United Nations Development Programme and the Ministry of Environment, the workshop started with an introductory presentation on the objectives of the Global Low Emission Capacity Project, followed by the components of the local LECB project.

The Mitigation and MRV Partnership’s NAMA tool – a step-by-step guide for moving a NAMA from idea towards implementation was then presented, providing a brief instructions on how to develop a NAMA (http://mitigationpartnership.net/sites/default/files/nama_tool_8_6.pdf), navigating through the relevant information, knowledge, instruments, and publications available.

³ To date, Lebanon succeeded in registering 7 CDM projects.
⁴ Presentations are attached in Annex 3. They can also be accessed at: http://www.mitigationpartnership.net/workshop-nama-design-and-preparation-consultation-selecting-priority-namas-lebanon
Information on the UNFCCC’s NAMA Registry (https:// unfccc.int/cooperation_support/nama/items/6945.php) with potential funding sources was then provided.

A case-study on developing a NAMA (Transport) was presented providing an overview of “on the ground” experience and difficulties while developing a NAMA.

A six-steps NAMA governance was then presented to the stakeholders, explaining the procedures to follow in Lebanon while developing a NAMA. The proposed selection criteria, along with the suggested weights for multi-criteria analysis were then introduced to the stakeholders for consideration, discussion and validation as indicated in table 1.

Table 1. The proposed selection criteria with their weights

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weights</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG reduction potential</td>
<td>1.5</td>
<td>The GHG reduction potential is expressed in terms of amount of CO$_{2}$eq avoided every year from the implementation of each NAMA project idea. It is roughly estimated at this stage and will be more elaborated at the project preparation stage.</td>
</tr>
<tr>
<td>Co-benefits</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Economic co-benefits</td>
<td></td>
<td>It includes economic growth, improved livelihoods, increased household income, energy security, etc.</td>
</tr>
<tr>
<td>Social co-benefits</td>
<td></td>
<td>It includes poverty reduction, improved lifestyle, improved use of time, improved public services etc.</td>
</tr>
<tr>
<td>Environmental co-benefits</td>
<td></td>
<td>It includes improved local air quality, improved waste management, etc.</td>
</tr>
<tr>
<td>Adaptation to Climate Change</td>
<td></td>
<td>It includes improved water availability, reduced soil erosion, reduced deforestation, etc.</td>
</tr>
<tr>
<td>High level political support</td>
<td>2</td>
<td>Proposed actions should be in line with the government’s national or sectoral priorities and should build upon and feed into existing initiatives.</td>
</tr>
<tr>
<td>MRV- ability</td>
<td>1.5</td>
<td>The MRV-ability of a proposed NAMA is expressed in terms of availability of a baseline, indicators for actions and milestones that would facilitate the monitoring of the GHG reductions resulting from the project.</td>
</tr>
<tr>
<td>Institutional readiness to implement</td>
<td>2</td>
<td>The institution that has the mandate to execute the NAMA project idea should have the necessary institutional, technical, managerial and human capacities to implement the proposed project.</td>
</tr>
</tbody>
</table>

See Annex 4.
The afternoon session was dedicated to the presentation of 13 NAMA ideas encompassing the energy, waste and transport sectors:

1. Waste-to-Energy (75.5 MW) supporting the national 12% RE target – by the Ministry of Environment;
2. Anaerobic digestion and electricity generation (15-25 MW) supporting the national 12% RE target – by the Ministry of Environment (as part of the 2\textsuperscript{nd} TNA outputs);
3. Photovoltaic power station (10 MW) supporting the national 12% RE target – by the Ministry of Environment (as part of the 2\textsuperscript{nd} TNA outputs);
4. Enhancing hydropower potential (233 MW new generation + 92 MW rehabilitation) supporting the national 12% RE target – by the Ministry of Energy and Water (as part of the Policy Paper of the Energy Sector);
5. Large wind farm (500 MW) supporting the national 12% RE target – by the UNDP Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon (as part of the Policy Paper of the Energy Sector);
6. Enhancing micro-hydropower potential (5 MW & more) supporting the national 12% target – by the Ministry of Energy and Water (as part of the Policy Paper of the Energy Sector);
7. Rehabilitation of the Zouk and Jieh power plants to restore performances and reduce emissions – by the Ministry of Energy and Water (as part of the Policy Paper of the Energy Sector);
8. Waste-to-Energy from Wastewater treatment plants: Energy from Waste water Sewage Sludge in Lebanon (7.32 MW to 11.68 MW) – by the Ministry of Energy and Water;
9. HFO conditioning solution for the conventional thermal power plants of Zouk, Jieh and Hreiche to reduce emissions and HFO consumption – by the Ministry of Energy and Water (as part of the Policy Paper of the Energy Sector);
10. Scaling up renewable energy and energy efficiency in the Lebanese building sector – by the Lebanese Center for Energy Conservation (as part of the National Energy Efficiency Action Plan);
11. Passenger cars swap programme by fuel efficient vehicles – by the Ministry of Environment (as part of the 2\textsuperscript{nd} TNA outputs);
12. Passenger cars swap programme by hybrid electric vehicles – by the Ministry of Environment (as part of the 2\textsuperscript{nd} TNA outputs);
13. Bus mass transit on dedicated lanes – by the Ministry of Environment (as part of the 2\textsuperscript{nd} TNA outputs).

The main discussion during the workshop revolved around three items: 1) proposed selection criteria; 2) proposed weights, and 3) suitability of the proposed NAMA ideas to be developed into NAMAs.

\footnote{This and the previous NAMA idea (fuel efficient vehicles and hybrid electric vehicles) have been combined into one NAMA idea}
Workshop Conclusions

From the proposed criteria, discussions stressed on the importance of “ownership” of the proposed NAMAs from the initial stages and the importance of institutional support to bring NAMA from initial concepts to a solid proposal.

The observations made during the workshop resulted in the addition of two “requirement criteria”, which would allow the Ministry of Environment to determine whether the 13 NAMA ideas comply with the following pass/fail “required criteria”:

1. Identified financing source and type, i.e., whether the proposed idea has already an allocated budget – in which case it could be further considered as a “unilateral NAMA”, and whether the funding in from a national source as opposed to an external funding source not originally allocated/earmarked as climate financing but is official development assistance to Lebanon. If the entire NAMA idea is funded by ODA, it cannot be considered as NAMA-able. If a portion of the funding is already secured from ODA or government funding, only the additional funding requirements can be requested through a NAMA process in which case the allocations have to be clearly identified and tracked.

2. Transformational, i.e., whether the proposed NAMA idea is a one single action that would not lead to a e.g., market or policy transformation leading to a low emission strategy. That is a NAMA should strive for strategic, long-term sustainable development benefits beyond mere GHG emissions reductions and aim at catalysing transformation of the national or sectoral development towards a less or low carbon development path.

Only the NAMA ideas that pass the pre-qualification selection will be further considered as part of the prioritization process.

Two additional criteria were proposed to the ones presented (see table 1):

1. Market readiness: to what extend the market is ready (barriers/opportunities) to pick up the proposed technology/plan/strategy;

2. Financial attractiveness: feasibility in attracting NAMA financing in terms of achieving maximum impact (catalytic in overcoming policy, market, financial, or technological barriers) with available funding, providing a sense of cost-effectiveness of the proposed NAMA.

As for the weights, initially, it was proposed to increase the “GHG reduction potential” and “co-benefits” weights from 1.5 to 2, and from 1 to 2 respectively. However, after intensive discussions it was agreed to have a two-level weighting approach; the first one ranging from 1 to 3 and indicating the ranking of the NAMA idea vis-a-vis the selection criteria (e.g., if the “GHG reduction potential” of the NAMA idea is high, then the score would be 3 – if medium, then 2 – if low, then 1; if the “institutional readiness to implement” is high, then the score would be 3 - if medium, then 2 – if low, then 1).

Following this ranking, ranking of the different criteria compared to each other is conducted (giving preferential scores out of 100 to the criteria that are deemed more important). The final score is the result of the multiplication of the ranking score with the preferential score. The total is obtained by
multiplying the relevance/ranking score with the preferential score. Table 2 depicts the new selection criteria with the weighting system.

Table 2. The selection criteria with their weights

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking score (1, 2 or 3)</th>
<th>Preferential score (out of 100, i.e. the total of this column should be 100)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG reduction potential</td>
<td>1 (3)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Co-benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Economic co-benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Social co-benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Environmental co-benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adaptation to Climate Change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High level political support</td>
<td>2 (3)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>MRV- ability</td>
<td>3 (2)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Institutional readiness to implement</td>
<td>1 (2)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Market readiness</td>
<td>2(1)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Financial feasibility</td>
<td>1 (3)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Other observations from the workshop included the benefits of using existing national documents (reports/policies/plans) such as the national communications and technology assessment reports, the policy paper for the energy sector, the national energy efficiency action plan, and the various renewable energy national potential assessments (wind atlas, and bioenergy potential) in drawing a first list of NAMA ideas.

However, the factsheets representing the NAMA ideas should have comparable level of details to better inform the prioritization exercise and to ensure a fair comparison process to assign priorities.

**Next Steps**

It is important to continue the engagement of the different stakeholders, and further clarify the NAMA process. Capacity building should also be assessed and the buy-in of the various institutions sought before taking further the NAMA ideas. This will be done on bilateral basis given that the number of the stakeholders presenting NAMA ideas (other than the Ministry of Environment) is not high.

The NAMA factsheets should be brought up to comparable levels in order to provide a more sound assessment tools. The project will conduct a series of bilateral meetings with the counterparts who proposed NAMA ideas during this workshop, in order to clarify the decisions taken during the workshop, and finalise the prioritization workshop. This would serve an opportunity to fine tune the proposals, and concentrate on the most promising NAMA ideas. Following that, the amended selection criteria and process will be shared with the stakeholders for scoring, in order to finalise the prioritization process. A follow-up workshop is planned to take place in August 2013 at the Ministry of Environment.
Annexes
Annex 1. Agenda
Annex 2. List of Participants
Annex 3. Presentations
Annex 4. NAMA institutional arrangements for Lebanon
Annex 1. Agenda

### NAMA DESIGN AND PREPARATION:
Consultation on selecting priority NAMAs for Lebanon

**Holiday Inn Verdun**

**Beirut – May 22, 2013**

<table>
<thead>
<tr>
<th>Time</th>
<th>Sessions</th>
<th>Potential speakers</th>
<th>Objective of the session</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00-9.30</td>
<td>Registration</td>
<td></td>
<td></td>
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<tr>
<td>9.30</td>
<td>Welcoming notes/opening</td>
<td>UNDP MoE</td>
<td>To introduce the objectives of the workshop</td>
</tr>
<tr>
<td>9.35</td>
<td>Introduction of the Global LECB Programme &amp; the national LECB project</td>
<td>Yamil Bonduki, Vahakn Kabakian</td>
<td>To introduce the context of the workshop within the LECB project</td>
</tr>
<tr>
<td>9.45</td>
<td>NAMA Tool part 1 Definitions and development of NAMAs: a step by step guide</td>
<td>MRV Partnership</td>
<td>To define NAMAs and the types of NAMAs, present the steps needed to proceed from NAMA design to implementation (baseline, GHG reduction potential, etc.), including institutional arrangements</td>
</tr>
<tr>
<td></td>
<td>Q&amp;A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.15</td>
<td>Coffee break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.40</td>
<td>NAMA Tool part 2 Technical aspects and requirements of NAMAs (other than GHG reduction)</td>
<td>MRV partnership</td>
<td>To present the elements to consider when developing a NAMA, explain the potential MRV consideration at the different NAMA development stages</td>
</tr>
<tr>
<td></td>
<td>- National Capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Co-benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Elements of MRV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q&amp;A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.10</td>
<td>International commitments of submitting NAMAs to UNFCCC NAMA Registry, and potential funding sources</td>
<td>Yamil Bonduki</td>
<td>To present the NAMA Registry, highlight the benefits and commitments of submitting NAMAs to the Registry, present funding sources</td>
</tr>
<tr>
<td></td>
<td>Q&amp;A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.30</td>
<td>Case Study: From design to implementation - private sector involvement and donor funding requirements</td>
<td>KPMG</td>
<td>To illustrate a concrete example elaborating on the above sessions</td>
</tr>
<tr>
<td></td>
<td>Q&amp;A</td>
<td></td>
<td></td>
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<tr>
<td>12.00</td>
<td>National institutional arrangements and consultation on</td>
<td>Vahakn Kabakian</td>
<td>To clarify the role of MoE as official coordinating entity</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Organizer(s)</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.00</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>NAMA options for Lebanon – 1st Long-list</td>
<td>MoE with partner institutions</td>
<td>- To showcase the potential concept ideas for Lebanon, based on prepared sectoral factsheets</td>
</tr>
<tr>
<td>3.00</td>
<td>Discussion: Prioritization of NAMAs concepts for Lebanon – simulation exercise</td>
<td>MoE/GSU/MRV/KPMG</td>
<td>- Prioritization exercise/simulation using Multi-criteria Analysis</td>
</tr>
<tr>
<td>3.45</td>
<td>Coffee break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>Discussion: Prioritization of NAMAs concepts for Lebanon – simulation exercise - continued</td>
<td>MoE/GSU/MRV/KPMG</td>
<td>- Prioritization exercise/simulation using Multi-criteria Analysis</td>
</tr>
<tr>
<td>4.45</td>
<td>NAMAs in Lebanon: Next Steps</td>
<td>MoE</td>
<td>- To draw the future steps and workplan</td>
</tr>
</tbody>
</table>
## Annex 2. List of Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Marwan Chalhoub</td>
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<tr>
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<tr>
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<tr>
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<tr>
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<tr>
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<td>03-268339</td>
</tr>
<tr>
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</table>
Annex 3. Presentations

The Low Emission Capacity Building (LECB) Programme: Overview

NAMA Design and Preparation: Consultation on selecting priority NAMAs for Lebanon

Holiday Inn Verdun
Beirut – May 22, 2013

Yamil Bonduki, UNDP

Why reduce GHG emissions?

The international perspective

- Without global commitment, unable to achieve target of limiting average global temperature rise to 2°C above pre-industrial levels
- Bali Action Plan (2007): Parties agreed to targets for developed countries and NAMAs for developing countries
- To access the Green Climate Fund: Countries will submit programmes and funding plans based upon national development and climate change strategies
Why reduce GHG emissions?

The national perspective

For most developing countries, mitigation must be seen in context of social and economic development, including poverty eradication

- Cost savings: $1 additional invested in more efficient electrical equipment, appliances and buildings avoids more than $2 of investment in electricity supply (IEA, 2006)
- Energy Security: CC mitigation can lead to greater energy security and resilience to energy price shocks
- Private sector: Attracted to new technology investment opportunities
- Public health: Improved (fewer airborne pollutants)

Looking for strategic opportunities

International obligations

National development goals

- “Win-win” mitigation measures, short-medium terms
- Also addressing the long-term opportunities & priorities
- Climate finance readiness

Low Emission Capacity Building Programme - overview

$28 M (European Commission, the Government of Germany and the Government of Australia)

Six-year programme (2011-16), 25 countries

- 14 Phase 1 countries (from 2011)
- 11 Phase 2 countries (from 2012): including Lebanon

In late 2012:

- EC contributed with additional 5M Euro to establish “NAMA-Net”, a network of centres of excellence to provide technical backstopping to LECB countries
- Germany contributed with additional 5M Euro for enhanced support to select LECB countries in given areas
Programme objective is to build capacities for mitigation action...

Objective: Build capacities to design and implement Low Emission Development Strategies and national mitigation actions in the public and/or industry sectors

Five main work areas:
- GHG inventory management systems
- Nationally Appropriate Mitigation Actions (NAMAs)
- Low-Emission Development Strategies (LEDS)
- Measurement, Reporting and Verification (MRV)
- Mitigation actions in selected industries/private sector

Desired outcomes of the Programme
- Holistic policies/programmes to address climate change through mitigation action linked to development priorities
- Removal of technical and institutional barriers – strengthened capacities to support NAMAs, LEDS
- Strategies to direct public and private investments (international and national)
- Improved scenarios and projections that allow more informed decision making on GHG mitigation
- South-south exchange of knowledge, tools, approaches
- Readiness for climate finance to access a range of funding sources
Country sectoral mapping

<table>
<thead>
<tr>
<th>Industry</th>
<th>No. of countries selecting sector</th>
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<tr>
<td>Cement</td>
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<tr>
<td>Iron/steel</td>
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<tr>
<td>Fertilizer</td>
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<td>Chemicals</td>
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<td>Bricks</td>
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<td>Housing</td>
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<tr>
<td>Motorcycles</td>
<td>7</td>
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<tr>
<td>Aluminium</td>
<td>3</td>
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<tr>
<td>Pulp &amp; Paper</td>
<td>0</td>
</tr>
<tr>
<td>Mining</td>
<td>12</td>
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</table>

* Preliminary figures: subset of all Phase 2 countries

Global Support Team offers support via:

**Targeted technical assistance**
- Targeted backstopping (in-country and on-line)
- Guidance on potential international/regional experts & centres
- Technical reviews of materials
- Guidance documents (templates and technical guidance)
- Knowledge exchange workshops and thematic trainings

**Knowledge sharing, outreach & partnerships**
- Partnerships with Centers of Excellence/Regional Networks
- South-south/north-south knowledge exchange
- Capture and sharing of best practices and lessons learned
- UNDP Teamworks site & external website
Low Emission Capacity Building project

Vahakn Kabakian
NAMA Design and Preparation:
Consultation on selecting priority NAMAs for Lebanon
May 22, 2013

Objectives

1. Improve Lebanon’s GHG reporting infrastructure, institutional capacities, information sharing processes
2. Prepare the ground for low emission development strategies through NAMA implementations

Funded by EC & German Government and the Australian Government
Implemented by UNDP and executed by MoE
Project life: 2013-2015

Project Components

Output 1:
Robust national system for the preparation of GHG emission inventory system
1.1. Capacity assessment of focal points
1.2. Support tools developed
1.3. Training conducted

Output 2:
2 NAMA identification/prioritization, and concepts and proposals formulation within the national developmental priorities (initial sectors: waste, energy and industrial sectors)
2.1. Up to 5 NAMA concept notes
2.2. 2 detailed NAMA proposals
2.3. Financing plan

Output 3:
MRV systems created to support the implementation and evaluation of identified NAMAs
3.1. MRV system developed
3.2. MRV process and tools communicated
LEDS Framework

National Strategic Development Planning
Low Emission Development Strategies
1st & 2nd National Communications (1999 & 2011)
TNA Project (2012)
TNC Project
LECB Project
BUR (Upcoming 2013-2014)
Mo/EU StREG (upcoming)

Today’s event.....
1. Is part of Output 2: NAMA identification and prioritization leading to NAMA proposals to be submitted to potential implementers and to the NAMA Registry
2. NAMA tool – step by step guide
3. NAMA Registry and potential funding sources
4. Case study (lessons learned)
5. Institutional arrangement
6. Selection criteria: discussion and validation
7. Overview of the first NAMA long-list
8. Simulation of a NAMA prioritization

Keep in mind
• This is a learning exercise of a process that we have to conduct periodically
• If a NAMA idea doesn’t go through this time, it doesn’t mean that it will not be considered in the next round
• Other sectors will be covered later
• The important thing is to understand the process and the approach
NAMA Tool

NAMA Design and Preparation:
Consultation on selecting priority NAMAs for Lebanon
Beirut, 22 May 2013

Klaus Wenzel
Head, ICI Support Project for the International Partnership on Mitigation and MRV
GIZ Environment & Climate Change Division

What is a NAMA???

NAMA Process

NAMA-identification & prioritization (from TNA long-list to short-list)
Development & submission of a/several NAMA-proposal(s)
Implementation and Operation/MRV

“NAMA-Readiness”
Objectives

- **Workshop**
  - selecting a couple of priority NAMAs for further development of comprehensive NAMA proposals and submission to potential implementers and to the NAMA Registry (country-driven selection)

- **The way ahead**: development of NAMA proposals respecting quality requirements by public and private financing partners
  - How to develop a "bankable" NAMA proposal using a step by step guide (GIZ "NAMA Tool"): background, definitions, elements and requirements of NAMA proposals
  - Selection criteria of the NAMA Facility

NAMA Facility

- Announced in Doha on 06.12.12 by German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and UK Department of Energy and Climate Change (DECC)
- DECC committed £25m (ca. €30 million), BMU another €40m (ca. £30m) = Total of ca. €70 million
- Designed to support developing countries that want to implement transformational country-led NAMAs in the short term
- Financial support & technical cooperation/capacity building
- Financial instruments: grants & concessional loans
- Call for proposals

NAMA Facility Governance Structure

NAMA Facility Board (comprises representatives of BMU & DECC) Directs implementation of NAMA Support Projects

Technical Support Unit (TSU) Channels funds for implementation via subcontracting by KfW & GIZ

TSU supports Board in:
- Decision making
- Communication
- Overall financial reporting and M&E
- Relations to governments and Delivery Organizations etc.

NAMA Support Projects
- Qualified Delivery Organization (DO)
- Qualified Delivery Organization (DO)
- Qualified Delivery Organization (DO)
- Qualified Delivery Organization (DO)
- ...
### Selection Criteria

<table>
<thead>
<tr>
<th>Eligibility Criteria</th>
<th>Ambition Criteria</th>
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<tr>
<td>Submitting entity: national government or qualified delivery organisation (DO)</td>
<td>Potential for transformational change:</td>
</tr>
<tr>
<td>Endorsement by national government / co-operation with qualified DO</td>
<td>• Element of broader programme or policy framework?</td>
</tr>
<tr>
<td>Degree of maturity (&quot;Readiness&quot;)</td>
<td>• Changes structure of sector, overcoming barriers?</td>
</tr>
<tr>
<td>Implementation time frame</td>
<td>• Builds capacities beyond project?</td>
</tr>
<tr>
<td>ODA eligibility</td>
<td>• Replicable and innovative?</td>
</tr>
<tr>
<td>Financing volume (5-15 m)</td>
<td>• Participation of private sector?</td>
</tr>
<tr>
<td>Feasibility (implementation &amp; MRV plan)</td>
<td>Co-benefits</td>
</tr>
<tr>
<td>Substantial funding contribution from other sources</td>
<td></td>
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<tr>
<td>Concept for the phase-out of support</td>
<td>Mitigation potential</td>
</tr>
</tbody>
</table>

#### How to find the NAMA Tool:

[www.mitigationpartnership.net](http://www.mitigationpartnership.net)

**Resources:**

**Activity:** "NAMA"

#### Types of NAMAs

![Diagram of Types of NAMAs](image)

Source: Perspectives, 2011
The Mitigation and MRV Partnership’s NAMA tool on how to develop a NAMA can be accessed on the following link: http://mitigationpartnership.net/sites/default/files/nama_tool_8_6.pdf
NAMA Registry and Financing Sources

NAMA Design and Preparation: Consultation on selecting priority NAMAs for Lebanon

Holiday Inn Verdun
Beirut – May 22, 2013

Presentation outline

• UNFCCC NAMA Registry

• Potential funding sources

UNFCCC NAMA Registry: Mandate

• COP 16: Parties agreed to set up a registry to:
  – record NAMAs seeking international support
  – facilitate the matching of finance, technology and capacity-building support with these actions
  – recognize other NAMAs.

• COP 17: Decided to develop the registry as a dynamic, web-based platform

• COP 18: Prototype registry to be deployed in April 2013

• Fully functional registry (based on user feedback) by Oct. 2013
UNFCCC NAMA Registry (1)

http://unfccc.int/cooperation_support/nama/items/6945.php

Prototype Registry hosts 4 NAMA templates:
- NAMA seeking support for preparation
- NAMA seeking support for implementation
- Other NAMAs for recognition
- Information on support for NAMAs

- Key design element is **flexibility**, at request of Parties
- A few **mandatory** fields of template are:
  - Country
  - NAMA title
  - NAMA description
  - Contact details

UNFCCC NAMA Registry (2)

For NAMA seeking support for **development**, can also include information on:
- Sector
- Technology
- Type of action (goal, strategy, programme/policy, project, other)
- National implementing entity
- Expected timeframe
- Cost (and currency)
- Relevant national policies, plans, programs, and/or other NAMAs

UNFCCC NAMA Registry (3)

For NAMA seeking support for **implementation**, can also include information on:
- Estimated full cost and incremental cost of implementation
- Estimated GHG reductions (and methodology used to calculate)
- Other indicators of implementation
- Other relevant information (incl. co-benefits)

Option exists for NAMA developer to edit information and update as need
**NAMA Prototype Registry content**

- **NAMAs seeking support for preparation**
  - 6 submissions between 19 Sept. 2012 and 27 Nov. 2012
  - Uruguay (3), Mali (2), Ethiopia (1)
- **NAMAs seeking support for implementation**:
  - 15 submissions between 20 Nov. 2012 and 17 April 2013
  - Serbia (7), Chile (3), Uruguay (1), Dominican Republic (1), Indonesia (1), Cook Islands (1), Dominica (1)
- **Other NAMAs for recognition**
  - 4 submissions between 22 Oct. 2012 and 17 April 2013
  - Uruguay (2), Chile (1), Serbia (1)

[http://unfccc.int/cooperation_support/nama/items/6945.php](http://unfccc.int/cooperation_support/nama/items/6945.php)

---

**NAMA Prototype Registry content**

NAMAs require central approval:

- **NAMA approvers**: full access to country registry (e.g. Focal point)
- **NAMA developers**: create NAMAs, edit/delete their NAMAs, search queries (e.g. project formulators)

Support does not require central approval

- **Support editors**: create support entries, edit/delete their entries, search queries
- **Actors**: government agencies, banks, foundations, private sector

---

**NAMA Registry: Manual**

**Part I: Design and functioning of the registry (mechanics)”**:
- access and user roles;
- The database and its sections;
- Workflows

**Part II: how to fill in the templates**
- NAMAs
- Support
NAMA Registry: Manual

- Participation is voluntary
- Not a requirement to receive or provide support
- Not an obligation to provide support or a guarantee that support will be provided
- Not a system for formally reporting on proposed actions or their results
- No requirements to verify the information. Responsibility lies within NAMA approver/support editor

Presentation outline

- UNFCCC NAMA Registry: International Commitments
- Potential funding sources

The Finance Challenge

Despite growing volume and variety of resources, developing countries face three key challenges to climate finance:

- **Uneven resources**: climate finance is not evenly spread, creating barriers to access, particularly for smaller countries
- **Need to catalyze private finance**: public finance alone is insufficient to meet demands of climate challenge, and so must catalyze private finance
- **Limited alignment between climate and development**: to drive an economy-wide transformation in production and consumption, climate finance must be mainstreamed into planning and development policy
Mitigation financing perspectives (1)

Cancun (2010): Long-term goal of mobilizing US$100 billion per year by 2020 to support developing countries to address climate change

“In energy sector alone, additional investment of close to $10.5 trillion needed globally in the period 2010-2030 to have 50% chance of maintaining GHG concentrations to less than 450 ppm.” (IEA, 2009)

Mitigation financing perspectives (2)

“At least USD 97 billion per annum of climate finance is currently being provided to support low-carbon, climate-resilient development.”

“The amount of private finance is almost three times greater than public finance.”

Climate Policy Initiative (CPI), 2011

Approximately 40% of the global additional investment needed in 2020 will come from households, 40% from businesses and remainder from governments (IEA (2009)

NAMAs likely to have phased financial structure (not just one source of finance)
Catalyse climate finance to attract private sector investments

Determine the appropriate “policy-mix” and financing options to create an enabling environment for catalysing climate finance:

1. Identify appropriate mitigation and adaptation technology options
2. Assess barriers to diffusion
3. Determine appropriate policy-mix
4. Select financing options

To date, GEF is largest provider of grant funds for CC mitigation

- GEF provides grant funding to create enabling environment and initiate a market transformation process
- Tends to focus on the removal of barriers, support for innovation, partial risk guarantees and demonstration efforts
- The GEF priorities for support are:
  - Enabling activities (national communications and technology needs assessments)
  - Removing barriers to Energy Efficiency
  - Removing barriers to Renewable Energy
  - Reducing the long-term costs of low-GHG emitting energy technologies
  - Sustainable Transport

Improved investment decision making through www.climatefinanceoptions.org
The CFO Platform assists users to:

- Learn about climate financing issues and ideas (Glossary, Library, Links)
- Plan their own project (On the Ground, Library)
- Research project feasibility (Tools) and how to finance it (Funding Sources & Tools)
- Formulate their project and collaborate with other CFO users (coming soon)

www.climatefinanceoptions.org

Expanding resources for climate finance information:
- 65 climate funding source analyses
- 23 in-depth case studies
- Nearly 100 climate finance publications in library, plus guides, and project analysis tools in knowledge center
- One-stop search engine to pinpoint specific user needs
- Climate finance tracking page brings together top monitoring data on fast-start funding

www.climatefinanceoptions.org

Broad categories of funding sources:
- **Bilateral (10 listed):** International Climate Fund (UK), International Climate Initiative (Germany), Global Climate Partnership Fund, the Hatoyama Initiative (Japan)....
- **Multilateral (46 listed):** ADB, AFD, CTI, EC, GEF, FCPF, KfW, IDB, MDB, ....
- **Foundations:** not listed
- **Private sector (5 listed):** Carbon Market Initiative, Africa Enterprise Challenge Fund: Renewable Energy and Adaptation to Climate Technologies, World Bank Carbon Funds and Facilities....

Key sources that will start playing a role in the future: the Green Climate Fund and the NAMA Facility (Germany and UK)

www.climatefinanceoptions.org
Introduction: KPMG’s Climate Change and Sustainability practice

Climate change and sustainability issues are rising to the top of corporate and government agendas. Energy pricing and security, natural resource pressures, population growth, lifestyle changes, and consumer preferences are compelling private and public organisations to act.

KPMG’s Climate Change and Sustainability works with:
- developed and developing country governments to create financeable and implementable green growth strategies appealing to financiers and corporates
- with corporates to understand climate change related risks and opportunities and to develop strategies to maximise competitive advantage

Low carbon development pathway

Development pathway for a developing country

Policy: setting policy frameworks that create direct markets and investment towards greener choices.

Technology: ensuring that green and more efficient technology is available in country.

Finance: ensuring that the green transition is financed and investment flows to the underlying projects.
Implementable low carbon strategies/NAMAs – creating partnerships

Barriers to finance

- NAMA plans are not concrete
- No policy security
- Lack of financeable projects/programs
- Low local capacity
- Unbalanced risk/reward
- Long-term investment commitment required

Addressing barriers

Addressing the barriers is key for creating implementable strategies

Making finance flow

- Secure policy
- Improve risk/reward matrix:
  - build the business case
  - use market mechanisms
  - project aggregation
  - guarantees
  - cheap debt
- Educate investors
- Build local capacity
- Transparent systems/MRV
- Develop financeable propositions

A country’s journey towards a financeable and implementable NAMA

Phase I - Scoping study
- Define country wide vision and objectives
- Identify and share best practices from other countries
- Identify priority sectors and key stakeholders
- Identify actions to deliver objectives
- Estimate the environmental impact and the overall cost
- Develop a high level implementation plan

Phase II - Design mechanisms and develop a strategy for implementation
- Finance
  - Stable policy
  - Transparent systems/MRV
  - Financeable programmes

- Host country governments
- Donor governments
- Local governments
- International public
- National public
- Private finance
- Infrastructure developers
- Multinational companies
- Corporates
- National governments
- Donor governments
- Host country governments
- Infrastructure developers
- Multinational companies
- Local businesses

Phase III - Implementation
- MRV mechanism
- Execute detailed implementation plan
- Implement pilots
- Monitor progress and share lessons learned
- Capacity development
- Due diligence for funding arrangements and payment processes

- A high level strategy and a concept note for each action identified
- Identification and design of concrete mechanisms that will minimise risks and achieve objectives
- A business case and a detailed implementation plan
- A market readiness strategy
- A capacity building plan
- Implementation and MRV

Review progress and report – knowledge transfer – continuous improvement
Principles of a financeable and implementable NAMA

Set the vision
- Provide a well articulated strategic vision for a particular sector
- Show how this NAMA project will help the country achieve the vision

Identify goals & benefits
- Translate strategic vision into concrete goals
- Engage with key stakeholders, identify and clearly communicate the key benefits that the program will deliver

Engage stakeholders
- Analyse key stakeholders’ business models and identify risks and opportunities
- Recommend options that specifically aim to overcome risks and capture opportunities

Develop a clear strategy
- Evaluate each recommendation based on clearly defined criteria
- Define a strategy that includes pragmatic, technically and financially feasible to implement options

Arrange finance
- Conduct a financial assessment of your project and confirm funding arrangements for each strategic option:
  - Private sector leverage
  - Donor country contribution
  - Host country contribution

Implement, measure, sustain
- Put in place a governance structure to support benefits’ realization
- Develop a clear implementation and delivery plan to operationalise the strategy
- Provide capacity building and continued MRV of the project

Developing a business case for zero/low emission taxi vehicles in Chile

Building up the Santiago Transport Green Zone

Mobilizing private sector investment in the context of NAMA

KPMG May 2013
A business plan for Green Zone Santiago

The road ahead

Step 1: Scoping study by Sistemas Sustentables

Step 2: Market analysis

Step 3: Analysis of business models of key stakeholders

Step 4: Financial analysis and design of incentive mechanisms

A business plan for Green Zone Santiago

E-taxis value chain and interdependencies

Key enablers

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Key enablers</th>
</tr>
</thead>
</table>
| Government  | • Business plan
              • Leadership
              • Private sector investments
              • Donor support |
| Taxi drivers| • Reduce capital costs
              • Increase awareness |
| Vehicle manufacturers | • Systematic legislation
                        • Infrastructure
                        • Incentives
                        • Partnerships
                        • Business plan |
| Power sector | • Partnerships
              • Incentives |
| Battery manufacturers | • Incentives |
| Financiers   | • Business models
              • Incentives |

Stakeholder engagement and our findings

Demand for low emission vehicles

Consumers/society:
- Improve air quality, health

Government:
- Improve enabling framework/create new markets
- Fuel standards incentives
- R&D support: infrastructure, finance
- Financial incentives; infrastructure

Fuel provider:
- Provide more efficient low carbon fuel/electricity
- E-taxis value chain and interdependencies

Taxi drivers:
- Buy more efficient cars & improve service
- Reliable technology: ongoing technical support

Reliable technology: ongoing technical support

Product input:

Vehicle/component manufacturers:
- Develop and deploy technology

Vehicle/component manufacturers:
- Systematic legislation
- Infrastructure
- Business plan

Financiers:
- Invest in new markets
- Financial support

Power sector:
- Partnerships
- Incentives
- Business plan

Battery manufacturers:
- • Partnerships
- • Incentives

Financiers:
- • Business models
- • Incentives
A business plan for Green Zone Santiago
Get the costs right: financial model

Why a financial model?

- Estimate costs
- Develop a clear financing plan
- Evaluate the viability of different incentive mechanisms
- Identify an optimal combination of incentives

Estimate costs – Test financing options – Enhance dialogue between key stakeholders

Stage 1: Country analysis

- Government
- Taxes
- OEMs
- Fuel providers
- Financiers
- Environmental
- price
- Product
- options
- Emission,
- Subsidy
- options

Stage 2: Taxi driver analysis

- Many plausible scenarios
- Incentive
- mechanisms
- Fuel
- consumption
- Emissions
- Interest rate
- Fixed and
- running costs

Key stakeholders

Key variables

A business plan for Green Zone Santiago
Make the finance flow: financial options

1. Grant Option
2. Support to existing intermediary/intermediaries that retail LEVs
3. Establishing a new single intermediary to retail LEVs
4. Subsiding an intermediary that provides both LEVs and infrastructure
5. Establishing an Investment Fund

A business plan for Green Zone Santiago
Partnerships

How fast the transition to a taxi LEV market will take place largely depends on the breadth and extent of partnerships developed between the key stakeholders involved

1. Business model creation;
2. Technology development and demonstration;
3. Policy development
Conclusions

1. There is misalignment between government’s vision for a green economy, the industrial policy and the structure of the financial system. This is constraining funding flows, restricting supply of projects and limiting the development of a green economy.

2. Finance is not often the main problem – lack of capacity across funders, project developers and government to develop projects is. Worth noting though that there is a shortage of funding for early-stage, high risk initiatives and for moving projects from research & development stage to scale-up and commercialization.

3. Skills on finance, policy, strategy and technology are essential to develop financeable and implementable projects.

4. Dialogue with key stakeholders early in the process is key to understand risks and opportunities and develop solutions that minimise risks and capture the opportunities.

5. Public-private partnerships offer promising solutions. A strong need for a key institution in the country to show strong leadership.

6. Flexibility as to the forms of domestic support is necessary.

7. Need for an independent party that doesn’t have a political agenda and understands the private sector language.

8. The costs and administrative burden of meeting the Monitoring, Evaluation and Reporting requirements of multilateral / bilateral funds reduces the appetite of local banks and project developers to access funding. This is limiting the uptake of multilateral / bilateral climate funds and limited implementation of projects by the private sector.

Recommendation

4 key actions to successfully implement the NAMA

To address the barriers identified and develop a business plan for the successful implementation of NAMA four key actions will be necessary.

1. Get the costs right

2. Make financing flow into the market

3. Develop new business models

4. Build partnerships
Institutional Arrangements and Selection Criteria

Vahakn Kabakian

NAMA Design and Preparation:
Consultation on selecting priority NAMAs for Lebanon
May 22, 2013

Institutional Arrangements

- Establishment of the National Council for the Environment (Decree 8157/24-5-2012)
- Council of Ministers appointed the Ministry of Environment as the National Coordinator of NAMAs (Decision 44/17-1-2013)
  - Requesting the MoE to start the process of NAMA preparation in coordination with the other ministries

Working Group 1: Transport Sector
Working Group 2: Power Sector
Working Group 3: Agriculture Sector
Working Group 4: Forestry Sector
Working Group 5: Industry Sector

Governmental Group
Secretariat Office
Coordinate activities

Research/Technical Support Group
Promote research and development on low carbon technologies to reduce greenhouse gases

National Council for the Environment
- Review and approve proposed policies - work plans
- Secure/approve required budgets

Structure

- Set priorities within each ministry
- Incorporate climate related factors into strategies
- Implement and execute the approved CC projects
Structure

National Council for the Environment

Research/Technical Support Group

Governmental Group

Working Group 1: Transport Sector

Working Group 2: Power Sector

Working Group 3: Agriculture Sector

Working Group 4: Forestry Sector

Working Group 5: Industry Sector

Tailored sector specific NAMAs

Climate Change Funding

International Multilateral Agreements
**NAMA Steps**

- **Step 1** GHG Emissions Inventories and Assessment of Presiding Framework Conditions
  - Identification of main sectors (baseline and BAU scenarios) and barriers
  - National Communication and Technology Needs Assessment processes

- **Step 2** NAMA Identification and Scoping
- **Step 3** NAMA Prioritization and Selection
- **Step 4** NAMA Preparation
- **Step 5** NAMA Registry
- **Step 6** Implementation and MRV
NAMA Steps

• **Step 2** NAMA Identification and Scoping
  – Collection of ideas that have potential to become NAMA – long-list
    • GHG reduction potential
    • Associated costs
    • Co-benefits
    • Feasibility of implementation

• **Step 3** NAMA Prioritization and Selection
  – Shorten the long-list using a set of selection criteria
    - GHG reduction potential
    - Sustainable development co-benefits
    - Institutional readiness to implement
    - MRV-ability
    - High-level political support
  – Decide the responsibilities of the different institutions per NAMA
  – Once a NAMA idea is selected, it can be developed into a NAMA concept note

• **Step 4** NAMA Preparation
  – Develop the full proposal:
    - Propose a plan of action with timelines and the role and responsibilities of associated actors
NAMA Steps

• **Step 5** NAMA Registry
  – Once a NAMA is presented to, and approved by, MoE → MoE officially “uploads” the NAMA to the NAMA Registry:
    • NAMA seeking support for preparation
    • NAMA seeking support for implementation
    • NAMA for recognition

NAMA Steps

• **Step 6** Implementation and MRV
  – Once funding is secured → start implementation
  – Continuously Measure, Report, Verify based on the elaborated MRV plan – includes reporting to the Ministry of Environment

Selection Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GHG reduction potential</td>
<td>The GHG reduction potential is expressed in terms of amount of CO₂eq avoided every year from the implementation of each NAMA project idea. It is roughly estimated at this stage and will be more elaborated at the project preparation stage.</td>
</tr>
<tr>
<td>2. Co-benefits</td>
<td>It includes economic growth, increased livelihoods, increased household income, energy security, etc.</td>
</tr>
<tr>
<td>Economic co-benefits</td>
<td>It includes poverty reduction, improved lifestyle, improved use of time, improved public services etc.</td>
</tr>
<tr>
<td>Social co-benefits</td>
<td>It includes improved local air quality, improved waste management, etc.</td>
</tr>
<tr>
<td>Environmental co-benefits</td>
<td>It includes improved water availability, reduced soil erosion, reduced deforestation, etc.</td>
</tr>
<tr>
<td>Adaptation to Climate Change</td>
<td>Proposed actions should be in line with the government’s national or sectoral priorities and should build upon and feed into existing initiatives.</td>
</tr>
<tr>
<td>3. High level political support</td>
<td>The MRV-ability of a proposed NAMA is expressed in terms of availability of a baseline, indicators for actions and milestones that would facilitate the monitoring of the GHG reductions resulting from the project.</td>
</tr>
<tr>
<td>4. MRV-ability</td>
<td>The institution that has the mandate to execute the NAMA project idea should have the necessary institutional, technical, managerial and human capacities to implement the proposed project.</td>
</tr>
</tbody>
</table>
Ministry of Environment - Lebanon

Weights of criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weights (% out of 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GHG reduction potential (and cost)</td>
<td>Combine with 1-2-3 weights</td>
</tr>
<tr>
<td>2. Co-benefits</td>
<td></td>
</tr>
<tr>
<td>- Economic co-benefits</td>
<td></td>
</tr>
<tr>
<td>- Social co-benefits</td>
<td></td>
</tr>
<tr>
<td>- Environmental co-benefits</td>
<td></td>
</tr>
<tr>
<td>- Adaptation to Climate Change</td>
<td></td>
</tr>
<tr>
<td>3. High level political support</td>
<td></td>
</tr>
<tr>
<td>4. MRV ability</td>
<td></td>
</tr>
<tr>
<td>5. Institutional readiness to implement (including legal)</td>
<td></td>
</tr>
<tr>
<td>6. Market readiness ??</td>
<td></td>
</tr>
<tr>
<td>7. Financial attractiveness (how easy to implement from financial point of view) (including private sector involvement)</td>
<td></td>
</tr>
</tbody>
</table>

Selection criteria GHG reduction potential Co-benefits* Average score of co-benefits High level political support MRV ability Institutional readiness to implement TOTAL score

<table>
<thead>
<tr>
<th>Project</th>
<th>GHG</th>
<th>Economic</th>
<th>Social</th>
<th>Env.</th>
<th>Adaptation to Climate Change</th>
<th>Average score of co-benefits</th>
<th>High level political support</th>
<th>MRV ability</th>
<th>Institutional readiness to implement</th>
<th>TOTAL score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power - PV (10 MW)</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Power - Hydro (233 - 30 MW)</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Power - Waste (231 MW)</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Power - Biogas (15 - 25 MW)</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Power - Waste to Energy (75.5 MW)</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Bus Rapid Transit with dedicated lanes</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Hybrid electric cars</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Fuel Efficient cars</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

*The score of this criterion is the averaged score of the economic, social, environmental and adaptation co-benefits.
NAMA options for Lebanon

Partner institutions

Rehabilitation of Zouk & Jieh P.P.
Hydro Development
Micro Hydro Energy
Waste to Energy from WWTP
HFO Conditioning

By Karim Osseiran
Energy Consultant at the MoEW
22 May 2013

Rehabilitation of Zouk & Jieh P.P.
Energy Consultant at the MoEW
22 May 2013

Economy
Rehabilitation of Zouk
Service & Energy

Consumption: 271 g/kwh → 220 g/kwh (→ 51 g/kwh)
Yearly consumption: 800,000 to 1,000,000 Tons

<table>
<thead>
<tr>
<th>Service &amp; Energy</th>
<th>Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (MW)</td>
<td>Cost of Production (USC/kWh)</td>
</tr>
<tr>
<td>Pdf Pfd</td>
<td>No Rehab</td>
</tr>
<tr>
<td>428</td>
<td>21.88</td>
</tr>
<tr>
<td>607</td>
<td></td>
</tr>
</tbody>
</table>

More than 1.5 hrs. per day improvement in service

Savings 67 Million $ per Year assuming same Mwh as current
Rehabilitation of Jieh

Service & Energy

<table>
<thead>
<tr>
<th>Capacity (MW)</th>
<th>No Rehab</th>
<th>Rehab</th>
</tr>
</thead>
<tbody>
<tr>
<td>227</td>
<td>1,016</td>
<td></td>
</tr>
<tr>
<td>326</td>
<td>1,704</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy (MWh)</th>
<th>No Rehab</th>
<th>Rehab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000,000</td>
<td>1,000,000</td>
<td></td>
</tr>
</tbody>
</table>

- More than 0.5 hrs. per day improvement in service

- Savings 49 Million $ per Year assuming same Mwh as current

Economy

<table>
<thead>
<tr>
<th>Cost of Production (USC/kWh)</th>
<th>No Rehab</th>
<th>Rehab</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.27</td>
<td>20.78</td>
<td></td>
</tr>
</tbody>
</table>

Hydro Development Possibilities

1- Rehabilitation & Upgrade of Existing Hydro Plants:
- Will increase the available Hydro generation capacity at least from 190 to 282 MW (+ 92 MW)

2- Installation of New Hydro Plants – Master Plan:
- 32 new sites were identified as follows:
  - Around 263 MW (1,271 GWh/y) with a cost of 667 M.$ in Run of River scheme
  - Around 368 MW (1,363 GWh/y) with a cost of 772 M.$ in Peak scheme

- 25 of these are economically viable with Minimum Selling Tariff < 12 $c/kWh:
  - Around 233 MW (1,126 GWh/y) with a cost of 560 M.$ in Run of River scheme
  - Around 315 MW (1,217 GWh/y) with a cost of 665 M.$ in Peak scheme

New Hydro Sites Feasibility Multi-Criteria Chart

- Results of Multi-criteria Analysis
- Environment Impact
- Minimum kWh Selling Tariff ($c/kWh)
- Chart from Sogreah Study

- Level 1
- Level 2
- Level 3

- Consumption: 315 g/kwh → 245 g/kwh (→ 70 g/kwh)
- Yearly Consumption: around 500,000 Tons

More than 0.5 hrs. per day improvement in service

- Around 1,000,000 tons
- Around 5,000,000 tons

Minimum kWh Selling Tariff ($c/kWh)

- Chart from Sogreah Study

- Environment Impact
- Results of Multi-criteria Analysis

- Level 1
- Level 2
- Level 3
### Non River Streams Micro Hydro Assessment

<table>
<thead>
<tr>
<th>Micro Hydro Stream</th>
<th>Public Institution</th>
<th>No. of Studied Sites todate</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation Channels &amp; Conveyors</td>
<td>All Water Establishments, Ministry of Agriculture</td>
<td>4</td>
<td>1.270</td>
</tr>
<tr>
<td>Waste Water Treatment Plants Intakes &amp; Outfalls</td>
<td>All Water Establishments, CDR</td>
<td>1</td>
<td>0.123</td>
</tr>
<tr>
<td>Electric Power Plants Outfall Channels</td>
<td>EDL Electric Power Plants</td>
<td>5</td>
<td>3.421</td>
</tr>
<tr>
<td>Municipal Water Distribution Networks</td>
<td>All Water Establishments, Municipalities</td>
<td>4</td>
<td>0.144</td>
</tr>
</tbody>
</table>

* Data from UNDP-CEDRO Study

### Anaerobic Digestion Technology: Principle & Requirements

- Anaerobic digestion is a process in which organic matter from wet organic wastes (i.e., waste water sludge, liquid & solid manure, food processing wastes, slaughterhouse residues, agriculture residues etc.) is converted into Biogas by bacteria in the absence of oxygen.

- The Biogas including 60% Methane (CH₄) is then collected and may be used to generate Electricity & Heat (1 Nm³ Biogas => 0.6 liters LFO).

- Biogas reduces emissions by preventing methane release in the atmosphere. Methane is 21 times stronger than carbon dioxide as a greenhouse gas.

- In addition, the AD process creates potentially valuable by-products, such as High Ammonia content fertilizer from hygienized sludge, and/or liquid with available nutrients.

- Finally the AD process has the advantage of Odor Control & Sludge volume reduction to (1/3).

### Waste to Energy from WWTP Summary

<table>
<thead>
<tr>
<th>Scenario 1: Sludge AD Only (6 Plants)</th>
<th>Scenario 2: Sludge AD with Added Sludge (7 + 14 plants)</th>
<th>Scenario 3: Sludge AD with Added Sludge &amp; Co-Digestion (7 + 14 plants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Installed Generation Capacity (Tripoli)</td>
<td>3.09 MW</td>
<td>3.09 MW</td>
</tr>
<tr>
<td>Additional Generation Capacity</td>
<td>4.23 MW</td>
<td>5.79 MW</td>
</tr>
<tr>
<td>Total Generation Capacity</td>
<td>7.32 MW</td>
<td>+ 21.4 % 8.88 MW</td>
</tr>
<tr>
<td>Electric Energy</td>
<td>54,276 MWh/y</td>
<td>+ 27.5 % 69,223 MWh/y</td>
</tr>
<tr>
<td>Heat Energy</td>
<td>57,059 MWh/y</td>
<td>72,774 MWh/y</td>
</tr>
<tr>
<td>CO₂ Reduction</td>
<td>-20,500 T CO₂e/y</td>
<td>+ 25.4 % -25,700 T CO₂e/y</td>
</tr>
<tr>
<td>Self Generation</td>
<td>75%</td>
<td>83% to 112%</td>
</tr>
<tr>
<td>Levelized Cost of Electricity*</td>
<td>N.A.</td>
<td>7.7 to 19.7 c/Kwh</td>
</tr>
</tbody>
</table>

* The heat & the fertilizers that are produced are an added benefit that has not been priced

Scenario 3 represents 3% to 4% of Lebanon’s Bioenergy Potential
### HFO Conditioning Solution: Summary Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Actual Baseline Level of Emission</th>
<th>Guaranteed Value of Improvement</th>
<th>Actual Results following a 6 months Trial Period on one Unit at Zouk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Matter – PM</td>
<td>536 mg/Nm³</td>
<td>50 % Reduction</td>
<td>87 % Reduction</td>
</tr>
<tr>
<td>Carbon Oxide – CO</td>
<td>841 ppm</td>
<td>80 % Reduction</td>
<td>91 % Reduction</td>
</tr>
<tr>
<td>Condensing Sulfur Trioxide – SO₃</td>
<td>1.35 ppm</td>
<td>80 % Reduction</td>
<td>87 % Reduction</td>
</tr>
<tr>
<td>Nitrogen Oxides - Nox</td>
<td>510 ppm</td>
<td>15 % Reduction</td>
<td>24 % Reduction</td>
</tr>
<tr>
<td>Fly Ash Acidity - pH</td>
<td>4.2</td>
<td>3.5 Minimum</td>
<td>2.5 to 3.0</td>
</tr>
<tr>
<td>Boiler Cleanliness</td>
<td>Clogging due to hard Deposits</td>
<td>Clean</td>
<td>Clean &amp; Old Deposits Removed</td>
</tr>
<tr>
<td>Boiler Efficiency – η</td>
<td>91.47 %</td>
<td>1% Increase</td>
<td>2% Increase</td>
</tr>
</tbody>
</table>

**THANK YOU**

**Wind Farm NAMA**

Hassan Harajli

22 May 2013
### Large wind farm (500 MW) to support the national 12% RE target

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Wind farm development in Lebanon, where Lebanon has at least 1500 MW of economically viable wind power to source.</th>
</tr>
</thead>
</table>
| Technology characteristics, highlights | - Renewable  
- Combustion-free  
- Competitive cost  
- Variable resource |
| Institutional and organizational requirements | - The government has released the first bidding document for a 50-100 MW wind farm, yet the regulatory framework of the released bid can be further solidified.  
- The large-scale renewable energy sector, esp. wind, needs a clear, transparent, and long-term regulatory framework to be established.  
- Local expertise does not exist since there are no wind farms to date in Lebanon.  
- More capacity building will be required for wider penetration  
- Utility requires training and upgrading (manpower and software) to enable them to handle the integration of variable resources of power. |
| Operation and maintenance | Technology is developed. Tenderers will have experienced operators on board. |
| Scale/Size of beneficiaries group | Nation-wide benefits. Lebanon will benefit as a whole in lowered blackouts |
| Disadvantages | - Variable resource  
- Can cause problems with migratory birds if not well mitigated |

### Costs & GHG Reduction

| Costs | Cost to implement mitigation technology  
CAPEX: USD 819,020,000 (USD 200,000,000 for first 100 MW; then 10% less per additional 100 MW)  
OPEX: 1% of CAPEX |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental cost to implement mitigation technology, compared to “business as usual”</td>
<td>$800-$1,000/kW</td>
</tr>
</tbody>
</table>
| GHG Reduction | Baseline: Large scale wind power non-existent  
Reduction potential: 1,030,483 tCO₂eq/yr |

### Development impacts, direct and indirect benefits

| Direct benefits | Added power to network to mitigate demand-supply deficit  
Fuel saving and combustion reduction |
|----------------|------------------------------------------------------------------------------------------------------------------|
| Reduction of vulnerability to climate change, indirect | - New businesses in installment, operation, logistics and maintenance.  
- Resources diversification  
- Rural income for landowners (and indirect economic benefits). |
| Economic benefits, indirect |  
- New jobs  
- Rural development  
- Pressures new education frontiers for wind integration  
- Awareness on renewables  
- Benefits to country as a whole in entering the large-scale wind farm (image) |
| Social benefits, indirect |  
- Income, Education  
- Reduction in GHG  
- Diversity of resources |
<table>
<thead>
<tr>
<th>Local Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunities and Barriers</strong></td>
</tr>
<tr>
<td>● Wind resources available</td>
</tr>
<tr>
<td>● Shortage of power available</td>
</tr>
<tr>
<td>● Less costly than fuel oil generation (which is used in Lebanon currently)</td>
</tr>
<tr>
<td>● Acquire large territories.</td>
</tr>
<tr>
<td>● Variability and management of variability</td>
</tr>
<tr>
<td><strong>Market potential</strong></td>
</tr>
<tr>
<td><strong>Status</strong></td>
</tr>
<tr>
<td><strong>Timeframe</strong></td>
</tr>
</tbody>
</table>

**THANK YOU**

**Scaling up renewable energy and energy efficiency in the Lebanese building sector**

*Rani Al Achkar, Energy Engineer*

*Lebanese Center for Energy Conservation (LCEC)*

*22 May 2013*
Scaling up RE and EE in the Lebanese building sector

Introduction

The strategy aims to significantly increase the uptake of building integrated RE and EE technologies and measures across the entire building sector (residential, commercial as well as public building) in Lebanon. The principle objective of the strategy is to reduce rising GHG emissions associated with energy use in the built environment.

Technology characteristics/highlights

Building integrated renewable energy focusing in particular on SWH and PV systems, as well as the full range of technologies for building energy efficiency.

Institutional and organizational requirements

- Upscaling of the financing mechanism
- Enactment of new building code and additional legislations
- Training/capacity building in both the private and public sectors required
- Demonstration and showcasing the best practice examples
- Ensure widespread dissemination

Scale/Size of beneficiaries group

The entire building sector in Lebanon covering all segments including residential, commercial as well as public buildings.

Disadvantages

- The implementation of minimal energy efficiency standards would increase the cost of construction.
- Modest rate of return of some energy efficiency investments.

Costs & GHG Reduction

<table>
<thead>
<tr>
<th>Costs</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost to implement mitigation technology</td>
<td>USD 49,000,000</td>
</tr>
<tr>
<td>Incremental cost to implement mitigation technology, compared to “business as usual”</td>
<td>USD 17,000,000</td>
</tr>
</tbody>
</table>

GHG Reduction

Baseline

- Already installed 43,500 SWHs (2011), 615 kWp PV systems benefitted from the existing financing mechanism (since end of 2012).
- 3 million CFLs were distributed part of the Lebanese CFL Replacement CDM project (2010).

Reduction potential

Initial broad estimates suggest that the NAMA may lead to total GHG emission reductions of over 14 mtCO2e until 2030.
### Development impacts, direct and indirect benefits

**Direct benefits**
- Creation of new jobs in the energy technology and energy services sector;
- Improved energy system reliability and energy security leading to reduced energy costs and greater productivity.

**Economic benefits, indirect**
- More reliable electricity supply and increased access to energy services for households. Reduced dependence on private self generators will increase disposable incomes of households given the high cost of private generation.

**Social benefits, indirect**
- Higher living standards and health benefits through improved building stock.

**Environmental benefits, indirect**
- Improvement of local environmental quality, e.g. reduction of noise and pollution from diesel generators.

### Local Context

#### Opportunities and Barriers

**Financial**
- Higher cost of RE and EE technologies and high cost of retrofitting for older buildings
- Access to capital (esp. as smaller projects and energy efficiency projects are not attractive for commercial banks)
- Risk perception of banks of RE and EE technologies
- Customs increase on RE technologies by Lebanese authorities

**Information**
- Lack of awareness and information (general public)
- Lack of technical expertise/know how (institutions, banks, engineers)
- Lack of building data and weather data

**Regulatory**
- The fact that Law 462 is not applied, which grants monopoly rights to EDL to supply electricity and prevents widespread access to feed into the national grid
- Lack of mandatory building code for energy performance

**Technical**
- Urban structure (shading of buildings reduces solar efficiency)

### Local Context (continued)

**Opportunities and Barriers (continued)**
- The barriers to a widespread adoption of sustainable energy technologies are only partly addressed by current programmes.
- There is a need to bring under one umbrella the activities envisaged to have them properly implemented and coordinated on ground.

**Market Potential**
- The building sector accounts for 25-45% of the total national energy consumption. Emissions are mainly associated with electricity use for lighting, water heating, cooling and space heating.
- With expected population growth, increasing urbanization and economic development over 300,000 new residential units will be built until 2030. Coupled with rising demand for household appliances as standards of living increase, there is a huge potential for both energy efficiency as well as building integrated renewable energy systems in this sector.
Local Context (continued)

| Status | • National Energy Efficiency Action Plan (NEEAP) approved by government in November 2011  
• Several initiatives have taken place in the development of the thermal standard for buildings.  
• A net metering scheme was introduced in December 2011  
• The National Energy Efficiency and Renewable Action (NEEREA) was set up by the government in cooperation with the National Bank of Lebanon, providing 0% interest loan facility over 14 years for businesses as well as households for energy efficiency and renewable technology investments. |
| Timeframe | • Preparation of the full NAMA proposal and implementation plan: during 2013  
• Implementation of the NAMA activities: 2014 to 2020 |

Thank you!

Ministry of Energy and Water (MEW)
Corniche du Fleuve, 1st Floor
Room 303, Beirut, Lebanon
www.lcecp.org.lb

Photovoltaic power station (10MW) to support the national 12% RE target

Dr. Farid Chaaban
22 May 2013
### Title of NAMA

**Introduction**

Technology for direct transfer of solar power to electricity via photovoltaic cells. These cells generate dc power which can be stored, or used, after inversion into AC.

**Technology characteristics/highlights**

- Renewable
- Combustion-free
- High cost
- Still developing

**Institutional and organizational requirements**

- It will require new policies and laws (e.g., feed in tariffs) with some incentives.
- Local expertise does exist, however, very few households have installed PV cells
- More capacity building will be required for wider penetration.

**Operation and maintenance**

Technology is developed, however improvements in terms of efficiency (R&D) will lead to higher acceptance. In terms of O&M, minimal effort is required.

**Scale/Size of beneficiaries group**

Small-scale applications due to high cost and availability of other renewable resources.

**Disadvantages**

- High cost.
- Low conversion efficiency.
- High maintenance cost.

### Costs & GHG Reduction

**Costs**

- **CAPEX:** USD 30,000,000
- **OPEX:** USD 300,000

**Incremental cost to implement mitigation technology, compared to “business as usual”**

**GHG Reduction**

- **Baseline:** Limited number of PV (mostly stand-alone) installed.
- **Reduction potential:** 11,777 tCO₂eq/yr

### Development impacts, direct and indirect benefits

<table>
<thead>
<tr>
<th>Direct benefits</th>
<th>Continuous generation with no shedding periods.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction of vulnerability to climate change, indirect</td>
<td>Fuel saving and combustion reduction</td>
</tr>
</tbody>
</table>
| Economic benefits, indirect | • New businesses on manufacturing, installment, and maintenance.  
• Resources diversification. |
| Social benefits, indirect | • Capacity building is deemed necessary  
• New jobs |
| Environmental benefits, indirect | • Reduction in GHG,  
• Diversity of resources |
Local Context

Opportunities and Barriers

- High cost of PV cells and the relevant electronic components for power inversion.
- Lack of incentives.
- Acquire large territories.

Market potential

Medium market potential since the cost is consistently dropping, and efficiency rising.

Status

Not adopted yet.

Timeframe

Medium term.

---

Waste treatment through anaerobic digestion and electricity generation (15-25MW)

Dr. Farid Chaaban
22 May 2013

Title of NAMA

Introduction

Solid waste is used as an alternative fuel to generate electricity. It is part of both national and sectoral policies of the energy and solid waste sectors.

Technology characteristics/highlights

- Anaerobic digestion of organic waste, which produces biogas (mainly methane) that is used for power generation.

Institutional and organizational requirements

Relevant regulations for waste collection needed. Capacity building is also required. Private sector should be encouraged to adopt the technology.

Operation and maintenance

High technical skills required. Capacity building and training needed. Municipalities should be brought in. The whole power network will benefit.

Scale/Size of beneficiaries group

The whole power network will benefit.

Disadvantages

Intricate operational requirement

Odors
Costs & GHG Reduction

<table>
<thead>
<tr>
<th>Costs</th>
<th>CAPEX: USD 47,500,000 (USD 1,900/kW)</th>
<th>OPEX: USD 1,187,500 (2.5%/yr of CAPEX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental cost to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>implement mitigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>technology, compared to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“business as usual”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG Reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>No biomass or waste to energy plant is installed or operational.</td>
<td></td>
</tr>
<tr>
<td>Reduction potential</td>
<td>95,688 tCO₂eq/yr</td>
<td></td>
</tr>
</tbody>
</table>

Development impacts, direct and indirect benefits

| Direct benefits             | 80%- efficient conversion process. |
| Reduction of vulnerability  | GHG emissions reduction.           |
| to climate change, indirect| Smaller solid waste management problem. |
| Economic benefits, indirect| New jobs.                         |
| Social benefits, indirect   | Better solid waste management.    |
| Income, Education           | New expertise to be developed.     |
| Environmental benefits,     | Additional income for municipalities. |
| indirect                    | Reduces amount of landfilled waste |
|                             | GHG emissions reduction, from the sectors |

Local Context

<table>
<thead>
<tr>
<th>Opportunities and Barriers</th>
<th>Lack of awareness could pose a problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market potential</td>
<td>Private sector involvement would result in goo market potential for the technology.</td>
</tr>
<tr>
<td>Status</td>
<td>Adopted by government</td>
</tr>
<tr>
<td>Timeframe</td>
<td>Medium term (5-7 years)</td>
</tr>
</tbody>
</table>
Implementation of the National solid waste Strategy using WtE Technology

Bassam SABBAGH
Head of Urban Environment Service
- Ministry of Environment -
22 May 2013

Title of NAMA

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Electricity Generation using solid waste as an alternative fuel</th>
</tr>
</thead>
</table>
| Technology characteristics | • Very Advanced Technology, especially in last 10 – 15 years  
• Low % in volume after incineration  
• Generation of electricity from solid waste |
| Institutional and organizational requirements | • Issuing of an integrated solid waste management law with its applicable decrees.  
• Adopting a financing and cost recovery system.  
• Specific Actions to be taken by the government considering incentives, awareness, indirect taxes, adoption of “polluter pays” principle  
• Some relevant regulations for waste collection needs to be amended.  
• Capacity building is required.  
• Private sector participation. |
| Operation and maintenance | • O & M done by the private sector  
• Initial cost paid by the government  
• Cost of waste collection is the responsibility of the Municipalities |
| Scale/Size of beneficiaries group | • Large benefit - EDL Economy financial sector lower pressure on LF Environment  
• Indirect benefit - Health Tourism |
| Disadvantages | • Lack of awareness  
• Technology not very well known by the public  
• High cost (but not higher than what we are paying now) |
Costs & GHG Reduction

**Costs**

| Cost to implement mitigation technology | CAPEX: around 1 Billion $ |
| OPEX: 36 Million $ |

**GHG Reduction**

| Baseline | No Incinerations installed |
| Potential reduction |
| • 400,122 tCO₂eq/yr (from fossil fuel replacement). |
| • Additional reduction from the entire solid waste management strategy is anticipated. |

**Impacts and Benefits**

**Direct benefits**
- Energy sector
- Solid Waste Management sector

**Reduction of vulnerability to climate change, indirect**
- Reduction of GHG emissions from electricity production and from illegal dumpsites and Landfills

**Economic benefits, indirect**
- New Jobs and market
- Better solid waste management
- Financial savings

**Social benefits, indirect**
- Income, Education
  - New expertise and technology to be developed

**Environmental benefits, indirect**
- Less landfill area requirement
- GHG emissions reduction
- Closure of all open dumps
- Less fuel used for electricity generation

**Local Context**

**Opportunities and Barriers**
- Less usage of fuel
- Less costly than fuel
- Lack of awareness

**Market potential**
- Reuse of Bottom ash in construction projects
- Private sector involvement

**Status**
- Adopted by the Government – Sept. 2010
- Preparation of the feasibility study (phase 1)

**Timeframe**
- Medium term (5 to 7 years)
THANK YOU
### Mitigation strategy

**Renew passenger cars fleet**

- **Economic and financial**
- **Market development**
- **Policy, legal and regulatory**

#### Examples of Car Renewal Programs

- **Prime à la casse**
- **Umweltprämie** (Environmental bonus)
- **US CARS Program**

#### Car sales according to French Bonus-Malus scheme

- **Low roll resistance tires**
- **4000**
- **150**

#### Manual transmissions

- **2010**
- **40%**

#### Exhaust gas recirculation

- **Engine downsizing**
- **20%**

#### Direct injection

- **30%**

#### Aerodynamic improvement

- **50**

#### Inefficient fleet

- **+**

#### Malus classes (None-efficient cars)

- **1000**

#### CVT

- **Shift indicator light**

#### Idling stop/start

- **10%**

#### Efficient auxiliaries

- **2009**
- **1500**

#### Lightweight vehicle design

- **2008**
- **1000**

#### Tire inflation monitoring

- **Econometer**

#### Turbocharging

- **Cylinder deactivation**

#### Estimated numbers:

- **Fast engine warm**
- **650**

### Fuel efficient gasoline vehicles

#### Technology characteristics

- **Fuel efficient vehicles are conventional gasoline vehicles with low consumption**

- **Reduce consumption and GHG emissions compared to today’s gasoline engines**
- **Improve air quality and increase energy supply security**

#### Addressable Market and Effective Demand for Fuel Efficient Vehicles by 2020(1)

- **Addressable market**
- **120,000 cars**
- **Effective demand**
- **20,000 cars**

#### Technology characteristics

- **Engine stop when the vehicle is at rest and brake energy recovery**
- **1000 - 4000 USD additional costs comparing to BAU after tax reforms**
- **May require a battery change over the vehicle life**
- **Increase hazard waste if policies not adopted**
- **Encourage use of passenger cars if intelligent policies are not adopted**

#### Addressable Market and Effective Demand for Hybrid Electric Vehicles by 2020(2)

- **Addressable market**
- **100,000 cars**
- **Effective demand**
- **20,000 cars**

---

* Estimated numbers: 1,300,000 cars. 33% of total cars in circulation; 55% eligible drivers to swap program; 65% eligible drivers interested in swap program for FEV.

1. Effective policies are not adopted

2. Intelligent policies are not adopted

---

57
Renew passenger cars fleet
Fuel and CO2 savings potential in Greater Beirut Area (Baseline 2007)

Cost benefits analysis
Specific transportation costs assessed in CBA:
Ownership cost
Operation cost
Air pollution
GHG emissions
Parking
Crash cost
Travel time
Congestion
Operation subsidies
Fuel tax revenues

Max hybrid car cost to allow a 100% government cost recovery 20,000 USD

Renew passenger cars fleet
Government’s cost and benefits: BAU 2020 v/s Mitigation Scenarios

Government Costs and Benefits per year relative to non-fuel efficient cars in Greater Beirut Area

BAU 2020
1,500,000 passenger cars

Mitigation 1 - 2020
1,305,000 passenger cars

Mitigation 2 - 2020
1,105,000 passenger cars

Ministry of Environment - Lebanon
**Renew passenger cars fleet**

**GHG emissions savings: BAU 2020 v/s Mitigation Scenarios**

<table>
<thead>
<tr>
<th>BAU 2020</th>
<th>Mitigation 1 - 2020</th>
<th>Mitigation 2 - 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,100,000 passenger cars</td>
<td>1,300,000 passenger cars</td>
<td>1,300,000 passenger cars</td>
</tr>
<tr>
<td>120,000 FEV</td>
<td>120,000 FEV</td>
<td>120,000 FEV</td>
</tr>
</tbody>
</table>

**GHG emissions savings relative to BAU in 2020**

<table>
<thead>
<tr>
<th>BAU - 2020</th>
<th>Mitigation 1 - 2020</th>
<th>Mitigation 2 - 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.66 M T CO2 eq</td>
<td>4.04 M T CO2 eq</td>
<td>4.64 M T CO2 eq</td>
</tr>
</tbody>
</table>

| 13% | 18% | 13% |

**Renew passenger cars fleet**

**Action plan for FEV-HEV swap program**

<table>
<thead>
<tr>
<th>Type</th>
<th>Priority sequence</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic and financial measures</td>
<td>1</td>
<td>Create market awareness</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Stop the bleed</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Remove old cars</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Regulate car imports</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Close the tap</td>
</tr>
<tr>
<td>Market development</td>
<td>6</td>
<td>Reform car leasing programs</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Monitor the progress</td>
</tr>
<tr>
<td>Policy, legal and regulatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional/organizational capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project monitoring and validation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mitigation technology**

**Bus technologies on dedicated lanes**

- 12-meter bus: Diesel, Gasoline, CNG, LNG, Electric and hybrid

- Need urban space for dedicated lanes
- Need an optimized network to serve all regions in the city
- High government investment expense
- Limited around scheduled stop/start delays are expected if not well managed
- Average speed could be lower than passenger cars if not using dedicated lanes

---

*Note: BAU 2020 emissions are assumed based on the IEA increment rate of Lebanon GHG emissions between 2000 and 2007.*
Bus mass transit on dedicated lanes

Development impacts: Fuel and CO\textsubscript{2} savings

- Electric and hybrid
- Diesel
- Gasoline
- CNG
- LNG

<table>
<thead>
<tr>
<th>Bus occupancy [pass/veh]</th>
<th>CO\textsubscript{2} emissions [g/pass.km]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
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<tr>
<td>20</td>
<td>20</td>
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<td>25</td>
<td>25</td>
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<td>30</td>
<td>30</td>
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<tr>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>25</td>
</tr>
</tbody>
</table>

Bus occupancy [pass/veh]

- Diesel
- Gasoline
- CNG
- LNG

Bus mass transit on dedicated lanes

Fuel cost savings

Up to 88% savings relative to passenger car during rush hours (30 pass/veh)

Bus mass transit on dedicated lanes

Cost benefits analysis

Specific transportation costs assessed in CBA:
- Ownership cost
- Operation cost
- Air pollution
- GHG emissions
- Parking
- Crash cost
- Travel time
- Congestion
- Operation subsidies
- Fuel tax revenues

Government’s benefits relative to non-fuel efficient car

Average savings relative to non fuel efficient car (%)
- GBA peak
- GBA off-peak
- Rural

Specific transportation costs assessed in CBA:

- Ownership cost
- Operation cost
- Air pollution
- GHG emissions
- Parking
- Crash cost
- Travel time
- Congestion
- Operation subsidies
- Fuel tax revenues
### Bus mass transit on dedicated lanes

**Action plan**

<table>
<thead>
<tr>
<th>Type</th>
<th>Priority sequence</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross and financial measures</strong></td>
<td>1</td>
<td>Develop employee package for taxi drivers including social benefits, insurance, retirement plans, etc.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Shift travel demand</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Ensure sufficient number of transit buses, powertrain technology, and maintenance and registration fees.</td>
</tr>
<tr>
<td><strong>Market development</strong></td>
<td>4</td>
<td>Design a bus network covering all boroughs within GBA and reserve lanes for bus operation</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Establish a bus network, ticketing system with appropriate reduced tariffs.</td>
</tr>
<tr>
<td><strong>Policy, legal and regulatory</strong></td>
<td>6</td>
<td>Design a bus network covering all boroughs within GBA and reserve lanes for bus operation</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Develop supply chain to ensure sufficient number of transit buses with proper powertrain technology</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Exempt mass transit buses (and spare parts) from custom/excise fees, and registration fees</td>
</tr>
<tr>
<td><strong>Institutional/organizational capacity</strong></td>
<td>9</td>
<td>Establish a bus network covering all boroughs within GBA and reserve lanes for bus operation</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Develop supply chain to ensure sufficient number of transit buses with proper powertrain technology</td>
</tr>
<tr>
<td><strong>Social awareness</strong></td>
<td>11</td>
<td>Establish a bus network covering all boroughs within GBA and reserve lanes for bus operation</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Develop technical expertise among TMO staff and high level management</td>
</tr>
<tr>
<td><strong>Project monitoring and validation</strong></td>
<td>13</td>
<td>Provide information on CO₂, fuel and cost savings comparing to passenger cars.</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Create Mobility Monitoring Indicators (MMI) framework</td>
</tr>
</tbody>
</table>

---

**Thank you for your attention**

Charbel MANSOUR, Ph.D charbel.mansour@lau.edu.lb
**UNFCCC - United Nations Framework Convention on Climate Change:**
An international environmental treaty produced at the 1992 Earth Summit in Rio de Janeiro with the objective to stabilize greenhouse gas concentrations in the atmosphere. Lebanon has been a Party to the UNFCCC since 1994.

**KP - Kyoto Protocol:** An international agreement linked to the UNFCCC adopted in Kyoto, Japan, in 1997 that sets binding targets for industrialized countries to reduce their emissions. Lebanon became a Party to the KP in 2006.

**GHG emissions - Greenhouse gas emissions:** Atmospheric gases that contribute to the greenhouse effect by absorbing infrared radiation produced by solar warming of the Earth’s surface. They include carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O).

---

**Nationally Appropriate Mitigation Actions (NAMAs)**

**Definition**
Nationally Appropriate Mitigation Actions are voluntary emission reduction proposals submitted by developing countries to the United Nations Framework Convention on Climate Change (UNFCCC). These government-prioritized actions aim at reducing GHG emissions from various sectors, and are expected to be the main vehicle for mitigation action in developing countries such as Lebanon under a future climate agreement.

As the name implies, NAMAs are nationally appropriate actions. They can be implemented at national, regional, or local levels, contribute to **sustainable development**, and are supported and enabled by technology, financing and capacity building, in a **measurable, reportable** and **verifiable** manner. Support can be requested for either the preparation of the NAMA concept or for its implementation. Lebanon can also choose to submit domestically-funded (or unilateral) NAMAs for recognition for which international support is not requested.

**Box 1: Key aspects of NAMA**
- Voluntary in nature
- In line with national or local development priorities
- Supported (technology, capacity building and financing) from domestic and/or international sources
- Reduces GHG emissions
- Transparent: Measurable

**Types of NAMAs**
Three broad types of NAMAs have been identified:
- **Unilateral NAMAs**: domestically funded and implemented without any support from an external funding source;
- **Supported NAMAs**: implemented with financial, technological and/or capacity building support from an external funding source;
- **Credited NAMAs**: generate revenues from selling carbon credits resulting from emissions reductions (NB: this market mechanism is not yet agreed on in the UNFCCC).

Furthermore, NAMAs can be:
- **Strategies**: such as a national renewable strategy – wind, solar, etc.
- **Policies**: such as an energy efficiency standard, a feed-in-tariff, etc.
- **Programmes**: such as an energy efficient lighting programme, etc.
- **Projects**: such as a bus rapid transit lane, etc.

In addition to requesting support for full-scale NAMA implementation, Lebanon can receive support for:
1) Capacity building and readiness for NAMA development;
2) Pilot projects that are part of a broader NAMA strategy and would help the development of such a strategy.
Benefits of NAMAs
The primary function of NAMAs is the direct reduction of GHG emissions. In addition, NAMAs should have important social, economic and environmental benefits. Since NAMAs in the various sectors are considered discrete set of measures that feed into the transition to a low-emission development, they provide an opportunity to achieve long term transformational change supporting sustainable economic growth in Lebanon. NAMAs also provide a great opportunity to engage with the private sector.

Measurement, Reporting and Verification requirements - MRV
The requirements for MRV of NAMAs entails having a strong, credible and transparent system for tracking GHG emissions that is consistent, comparable, complete and accurate. Therefore, one of the main challenges when designing and implementing a NAMA is its “MRV-ability”. The MRV in turn provides assurances that the NAMAs are contributing to emissions reduction, and that this reduction is monitored, the progress is reported and the results verified. NAMAs receiving international support are subject to both domestic and international MRV, while domestically-funded NAMAs are only subject to domestic MRV. All MRVs will be in accordance with guidelines to be developed under the UNFCCC.

The Clean Development Mechanism and NAMAs
CDM and NAMAs use divergent approaches, but both reduce GHG emissions. The primary difference is their rationale: whereas the CDM provides additional ways for developed countries to meet their emission reduction commitments under the KP through the purchase of project-based emissions reductions from developing countries, NAMAs are primarily conceived as a means for developing countries to reduce domestic emissions in the context of sustainable development. Programmatic CDM – “Programmes of Activities (POAs)” – is closer to the NAMA concept in terms of scale, since PoAs can cover policies and measures rather than individual projects. However, PoAs still generate credits. The differences between CDM and NAMAs are summarized in Table 1 below.

<table>
<thead>
<tr>
<th>Table 1: Differences between CDM and NAMAs - Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDM</strong></td>
</tr>
<tr>
<td><strong>Definition</strong></td>
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<tr>
<td></td>
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<tr>
<td><strong>Actions</strong></td>
</tr>
<tr>
<td><strong>Initiator</strong></td>
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<tr>
<td><strong>Return on investment</strong></td>
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<tr>
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<tr>
<td><strong>Preconditions</strong></td>
</tr>
<tr>
<td><strong>Requirement</strong></td>
</tr>
<tr>
<td><strong>Financing</strong></td>
</tr>
<tr>
<td><strong>Rulebook</strong></td>
</tr>
</tbody>
</table>

Source: adapted from GIZ and BMU. 2011.CDM and NAMAs – Overview and Differences. Transport and Mobility.
Steps for NAMA preparation in Lebanon

In Lebanon, the Ministry of Environment, as the National Coordinator for NAMAs appointed by the Council of Ministers, will consider a six-step NAMA process:

**Step 1 GHG Emissions Inventories and Assessment of Presiding Framework Conditions**
The first step serves at identifying the main GHG emission sources and sectors and preparing baseline and business-as-usual scenarios for the different sectors. In parallel, the assessment of the national framework conditions for mitigation, including the governance framework and general barriers for climate policy implementation, are considered. The Ministry of Environment has already undertaken this work, within the broader national context, through the National Communication and Technology Needs Assessment processes. These will serve as a starting platform since both processes were conducted with extensive stakeholder involvement (Reports available at http://undp.org.lb/communication/publications/index.cfm)

**Step 2 NAMA Identification and Scoping**
The Ministry of Environment, with inputs from stakeholders, will identify opportunities for mitigation actions that can be packaged as potential NAMAs for Lebanon. The evaluation of emission reduction potential, associated costs at both national and sectoral levels, co-benefits, and feasibility of implementation are important at this stage because once Lebanese NAMAs are submitted and financing is secured, they are subject to the agreed MRV requirements.

The long-list of identified NAMAs will be categorized into two sets: 1) NAMAs that request support from international funding sources for preparation or implementation, and, 2) NAMAs that will be implemented through national efforts (e.g. funding source is the national budget), i.e. domestic NAMAs.

**Step 3 NAMA Prioritization and Selection**
Based on a national consensus, the long-list of NAMAs (step 2) will be shortened by using two “requirement criteria” : 1) financing source and type, and 2) transformational aspect of the NAMA idea. Prioritization of the most feasible options to be further elaborated according to specific selection criteria developed for Lebanon (Box 2) will then be done. Prioritized NAMAs can be developed into concept notes aimed at policy-makers that provide a brief explanation of how each NAMA would work.

This step is led by the Ministry of Environment as the National Coordinator and requires strong stakeholder involvement, with a clear identification of the roles and responsibilities of the different institutions at this stage, especially in terms of who would be leading the preparation of the NAMAs in different sectors in order to avoid duplication of work, and secure buy-in of the relevant stakeholders.

**Step 4 NAMA Preparation**
With guidance and assistance provided by the Ministry of Environment, concerned Ministries/institutions will develop fully detailed NAMA proposals and submit them to the Ministry of Environment to be a basis for negotiation of support and implementation conditions between the government and sources of support. Key challenges anticipated in the development of a full NAMA proposal are the elaboration of robust financing and MRV plans.

---

**Box 2: Selection Criteria**

- GHG reduction potential
- Sustainable development co-benefits
- Institutional readiness to implement
- MRV-ability
- High-level political support
- Market readiness
Step 5 NAMA Registry
The UNFCCC has set up a NAMA registry to record submitted NAMAs and to facilitate the matching of finance, technology and capacity-building support for those NAMAs seeking international support. NAMA proposals should be presented and approved by the Ministry of Environment, to be officially submitted to the NAMA registry on behalf of the Lebanese government.

There are three types of relevant submission templates that can be used, depending on the request put forward:
1) NAMA seeking support for preparation;
2) NAMA seeking support for implementation;
3) NAMA for recognition;
The templates are available at: http://unfccc.int/cooperation_support/nama/items/6945.php.

Step 6 Implementation and MRV
The last step is the implementation of the NAMA within the relevant sectors once funding is secured and terms of the implementation agreed upon with the supporting countries. Throughout the lifetime of the action, there is a need for measuring, reporting and verifying the different aspects of NAMAs according the MRV plan elaborated and agreed with the investor.

In general, the more specific and quantified the NAMA is, the easier it will be to define a metric for MRV. Both the development and the implementation of the MRV system are a shared responsibility of the NAMA implementer and the Ministry of Environment, as different types of NAMAs require “custom-made” MRV systems. It is important that government departments willing to develop and implement NAMAs do so in close coordination with the Ministry of Environment. This will also facilitate progress during the implementation phase of the NAMA, since NAMA implementers will have to report to the Ministry of Environment on the progress of their respective NAMAs.

Biennial Update Reports and International Consultations and Analysis and NAMAs
The Convention requests developing countries, including Lebanon, to prepare and submit Biennial Update Reports (BURs) on a two-yearly basis. Among other things, the BUR provides information on mitigation actions – including NAMAs under implementation and planned – including a description of associated methodologies and assumptions, analysis of impacts, financial support received, and an update on implementation progress. The MRV report submitted by the NAMA implementer to the Ministry of Environment (in Step 6) serves as a basis for the BUR. The BUR is then subject to an International Consultations and Analysis (ICA) process conducted by an independent technical body of experts in consultation with Lebanon, which will result in a detailed analysis report available to the public.

For more information: http://www.moe.gov.lb/climatechange/contact.html