Lake Kivu Monitoring Programme

May 2019
Rubavu
1. Background

Methane resource
40 km$^3$ STP methane (CH$_4$)

Opportunities
• Electricity: 40 year, 700 MW
• Industrial development
• Fishing/Fish farming
• Oil
• Transport
• Science & Innovation

Uncertainties/Gaps
• Gas formation
• Gas accumulation
• Effects of gas extraction
• Inland Marine Classification

Dangers
• Safety of workers on extraction plants and of the public
• Gas releases (H$_2$S and CO$_2$ CH$_4$)
• Eutrophication
• Pollution of the ecosystem (biozone)
• Waste of Methane (CH$_4$) or other resources
2. Objectives and mandate

**Mandate of LKMP** (at its creation in 2008): ensure that methane gas extraction is done in a safe and sustainable way.

**Objectives:**

- Preserve the Lake’s stability (safety of the lake + safety of GEF - Gas Extraction Facilities)
- Protect the Lake’s environment (preserve the integrity of its ecosystem and its environment in general)
- Ensure socio economical optimization (avoid waste of the resource especially through inadequate extraction technology)
3. Activities

3.1. Summary of LKMP’s activities

- Elaboration of rules and regulations for safe and sustainable extraction of methane
  - MPs (Management Prescriptions for Development of lake Kivu Resources) by International Experts from 2007 to 2009
  - From 2010 up to now: Rwanda and DRC are working together to supervise the Review of MPs change Prescriptions into Bidding regulations to be enforced in Rwanda and DRC
  - Since 2017, the Review of MPs is coordinated at REG level. Tender is at the stage of notification and awarding the tender. The assignment should last 7 months.

- Monitoring activities:
  - Started with operationalization of KP in 2008 (small team monitoring the behaviour of the plume of re-injection under the supervision of an international expert in Limnology)
  - Now monitoring is done at 3 stage: near plant monitoring, whole lake monitoring and On plant monitoring

- Implementation of the project financed by the Netherlands: From August 2013 up to June 2019, with a budget of Euros 8.9 Millions. The project has 2 impacts, 6 outcomes and 6 outputs with limited duration. However, the activities of the program has to be sustainable and become an autonomous authority (on both side - BRA - MPs).
## Impacts

### 1. Lake Kivu system is better understood and its resources are used in a safe and sustainable way
- 1. The LKMP program is effectively implemented
- 2. External parties use LKMP data base information
- 3. Practical application of knowledge takes place

### 2. Conflict on Lake Kivu resources is prevented and bilateral cooperation is promoted
- 4. Inspections and monitoring lead to compliance to regulations
- 5. Rwanda and DRC are committed to one set of shared regulations
- 6. All stakeholders understand and support developments on Lake Kivu

## Outputs

### 1. The LKMP program is effectively implemented
- 1.1 To put in place operational tools and modalities for efficient working
- 1.2 To equip laboratory and enable it for lean and efficient services
- 1.3 To put in place an internal document management system
- 1.4 To educate and train field teams and support staff
- 1.5 To properly staff the LKMP

### 2. External parties use LKMP data base information
- 2.1 To enable Lake Kivu professional and scientific communications
- 2.2 To put in place data management and a data base system
- 2.3 To develop a policy on data sharing and to share this policy with partners

### 3. Practical application of knowledge takes place
- 3.1 To formalize and to operationalize early warning system
- 3.2 To operationalize partnerships with other institutions and knowledge centres
- 3.3 LKMP and partners make contributions to scientific and general knowledge of Lake Kivu
- 3.4 To carry out lake wide monitoring activities and reporting in a professional way
- 3.5 To carry out regular near-plant monitoring and reporting in a professional way

### 4. Inspections and monitoring lead to compliance to regulations
- 4.1 To contribute to review MPs also from a technical point of view, and to apply MPs in both countries
- 4.2 To operationalize inspection and monitoring
- 4.3 To improve and install inland marine regulations so that they allow for inspections on quality management
- 4.4 Operators apply recommendations and instructions are applied by operators and there is two way learning
- 4.5 To implement continuing inspections

### 5. Rwanda and DRC are committed to one set of shared regulations
- 5.1 To Support MP review, leading to guidelines for further institutional developments
- 5.2 To prepare requirements for signing a bilateral agreement (MoU) to detail monitoring and management of Lake Kivu
- 5.3 To establish an environment of support and controls with relevant committees
- 5.4 To formalize operational cooperation
- 5.5 To put in place a subsidisation system
- 5.6 To find an adequate host for LKMP

### 6. All stakeholders understand and support developments on Lake Kivu
- 6.1 To make and execute a communication strategy
- 6.2 To make and execute an annual communication plan

## Activities

### 1. LKMP capacity is strengthened on an operational level
- 1.1 To put in place operational tools and modalities for efficient working
- 1.2 To equip laboratory and enable it for lean and efficient services
- 1.3 To put in place an internal document management system
- 1.4 To educate and train field teams and support staff
- 1.5 To properly staff the LKMP

### 2. Data is managed and accessible for use, also by partner organisations
- 2.1 To enable Lake Kivu professional and scientific communications
- 2.2 To put in place data management and a data base system
- 2.3 To develop a policy on data sharing and to share this policy with partners

### 3. Knowledge of the lake system has increased and is shared with all stakeholders
- 3.1 To formalize and to operationalize early warning system
- 3.2 To operationalize partnerships with other institutions and knowledge centres
- 3.3 LKMP and partners make contributions to scientific and general knowledge of Lake Kivu
- 3.4 To carry out lake wide monitoring activities and reporting in a professional way
- 3.5 To carry out regular near-plant monitoring and reporting in a professional way

### 4. Monitoring and inspections are accepted routines with mandate
- 4.1 To contribute to review MPs also from a technical point of view, and to apply MPs in both countries
- 4.2 To operationalize inspection and monitoring
- 4.3 To improve and install inland marine regulations so that they allow for inspections on quality management
- 4.4 Operators apply recommendations and instructions are applied by operators and there is two way learning
- 4.5 To implement continuing inspections

### 5. A shared institutional development path is in place
- 5.1 To Support MP review, leading to guidelines for further institutional developments
- 5.2 To prepare requirements for signing a bilateral agreement (MoU) to detail monitoring and management of Lake Kivu
- 5.3 To establish an environment of support and controls with relevant committees
- 5.4 To formalize operational cooperation
- 5.5 To put in place a subsidisation system
- 5.6 To find an adequate host for LKMP

### 6. Communication with stakeholders has been effective
- 6.1 To make and execute a communication strategy
- 6.2 To make and execute an annual communication plan

## Financials

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<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>6,042,973</td>
</tr>
<tr>
<td>1.1 To put in place operational tools and modalities for efficient working</td>
<td>144,520</td>
</tr>
<tr>
<td>2.1 To enable Lake Kivu professional and scientific communications</td>
<td>1,155,009</td>
</tr>
<tr>
<td>3.1 To formalize and to operationalize early warning system</td>
<td>732,250</td>
</tr>
<tr>
<td>4.1 To contribute to review MPs also from a technical point of view, and to apply MPs in both countries</td>
<td>2,387,852</td>
</tr>
<tr>
<td>4.4 Operators apply recommendations and instructions are applied by operators and there is two way learning</td>
<td>256,149</td>
</tr>
</tbody>
</table>
3. Activities

3.2. Near plants monitoring (1)

Deep vertical profiles of temperature, pH, turbidity, salinity – oxygen in the mixing layer – are collected near the GEF on a regular basis in order to localise the re-injected waters and detect any impact on the stratification of the lake and on the mixing layer.
3. Activities

3.2. Near plant monitoring

Laboratory
3. Activities

3.2. Near plant monitoring: Field data collection

Deep vertical profiles of temperature, pH, turbidity, conductivity/salinity – oxygen in the mixing layer – are collected near GEF using CTD probes.
### 3. Activities

#### 3.3. Whole lake monitoring: Fish monitoring

<table>
<thead>
<tr>
<th>Weight Range (t)</th>
<th>Event Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,000 - 10,000</td>
<td>1998 FAO project <em>Kaningini et al., 1999</em></td>
</tr>
<tr>
<td>5,004 - 6,036</td>
<td>February-July 2008 ECOSYKI <em>Guillard et al., 2012</em></td>
</tr>
<tr>
<td>1,862 - 5,574</td>
<td>July 2012-July 2014 Biological baseline <em>Lake Kivu Monitoring Programme</em></td>
</tr>
</tbody>
</table>

*Fish distribution during the rainy (a.) and the dry seasons (b.), respectively in April 2013 and July 2014.*
3. Activities

3.4. On plant Inspection (OPI)

• Advise in identification of gas concession
• Advise in review of feasibility studies
• Active participation in negotiation of PPA and GCA
• Approval of extracting facilities at 3 stages (MPs): design, construction and operations
• Continuous and regular inspections of operating plants
3. Activities

3.5. Researches on the Lake

- **International consultants:**
  1. Update the estimation of gas reserves (4 groups of international experts)
  2. Study on water level, Deep currents and waves in Lake Kivu (DELTARES from the Netherlands)
  3. Fish study (Fish, planktons, invertebrates in Lake Kivu) by SCIMABIO
  4. Monitoring of seismic activities in and around the Lake (supervision by Tulane University)
  5. Set up an early warning system (from 2, 3 and even 4)
  6. Set up and manage an Integrated Data Management System (IDMS) of Lake Kivu data (ESRI)
  7. Develop a data sharing policy
3. Activities

3.5. Researches on the Lake

- **Experts Advisory Group – EAG** - (more than 80 international experts)
  - Advise in science and engineering (specific matters: KP due diligence, KivuWatt complaints, SYMBION review of designs,...)
  - Gas working group \(\Rightarrow\) updated estimation of gas reserves in the lake
  - Simulations of reinjected degassed water, gas processing,....
  - Review of the results of near plant + whole lake monitoring

- **Research by international partners** (USA, Switzerland, Belgium, Luxemburg ...) \(\Rightarrow\) International workshop

- **Research by regional research institutions** (see subsidization sub program)
3. Activities

3.6. Cooperation with DRC

- Review of MPs
- MoU between Rwanda and DRC signed in November 2015 (created Bilateral ad hoc committee and operational)
- Contribute to ABAKIR and to the Joint Technical Committee (Rwanda/DRC)
- Research on L. Kivu and set-up shared monitoring
  - Regional workshops on L. Kivu research
  - Regional Platform for Research on Lake Kivu (PRALK)
  - Subsidization sub program
3.6. Cooperation with DRC

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDRILAK+</td>
<td>assessment of <strong>hydrological regime and water resources dynamics</strong> of the Lake Kivu tributaries</td>
<td>UERHA - ISP/Bukavu, INES/Ruhengeri</td>
</tr>
<tr>
<td>ECOLIT+</td>
<td>assessment of the <strong>functioning of the littoral</strong> zone with focus on the potential influence of watershed on the littoral and the pelagic zones of Lake Kivu</td>
<td>UERHA - ISP/Bukavu, RAB + UR-CAVM</td>
</tr>
<tr>
<td>SUSFISH</td>
<td>Assessment of the <strong>fish stock</strong> in Lake Kivu and analysis of <strong>catches’ statistics</strong> for a sustainable fishery management</td>
<td>UERHA - ISP/Bukavu, RAB + UR-CAVM</td>
</tr>
<tr>
<td>GEODYN</td>
<td>Contribute to the knowledge of tectonic and gas from volcanoes, and produce a <strong>probabilistic seismic hazard map</strong> for the Lake Kivu</td>
<td>OVG, INES/Ruhengeri</td>
</tr>
<tr>
<td>KABUNO</td>
<td>Monitoring of <strong>Kabuno Bay</strong> physico-chemical parameters</td>
<td>OVG</td>
</tr>
</tbody>
</table>
3. Activities

3.7. Communication with stakeholders

- Lake wide monitoring
  - Growing Knowledge

- Monitoring & Inspection
  - Near plant Monitoring
  - On plant monitoring
  - Whole lake monitoring

- Capacity building

- Institutional development

- Data management

- Communication

Rwanda

DR Congo

Investors

Operators

Confidential

Regulators

Authorities

Obligation

Scientists

Population

Information

Funding agencies

Fishermen

International community

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3. Activities

3.7. Communication with stakeholders

Public awareness

Respond to worries

www.lake_Kivu.org

Talk shows (TV, radio)

News papers, Social medias

Scientific publications

Meetings

Workshops

Conferences
THANK YOU FOR YOUR ATTENTION