



LEAP-RE

Long-Term Joint EU-AU Research
and Innovation Partnership on Renewable Energy

Detailed Work Plan WP9 Geothermal Atlas for Africa (GAA)

Deliverable D9.1

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Acronym

MS	Milestone
M&E	Monitoring & Evaluation
WP	Work Package

1.1 Description of WP9 - GEOTHERMAL ATLAS FOR AFRICA

See Annex 1: WP9 GANTT Chart

Notice: the numbers of reported PMs come from the current version of GA (yet to be amended and finally approved): it might be revised in the light of the new organization for the excluded partners and the agreement with task leaders and UNEP. At this time, the proposed workload is reported in the **summary workload table** at page 12 of this document. In the table, UNEP's PMs are considered separately, because it is not part of the GA and does not get any grant as an Intl partner of UNIFI.

Work Package Leader- co-Leader: Daniele Fiaschi, University of Florence, Department of Industrial Engineering (UNIFI) & Abdelkader Aiat-Ouali (CDER)

Contributing partners: UNIFI, SU, TNO, GFZ, AAU, UoN, SSSA, UNITO, Fraunhofer, UU, BGS-UKRI, BRGM, CNR, Géo2D, ODDEG, DEKUT, UEM, NARSS, CDER, UDSM, UNEP

Objectives

To define the origin and location of low to high enthalpy geothermal resources for the development of African electricity production, plus a range of direct heat/cold use applications and water use. This will be achieved by identifying, organising, assessing, classifying and interpreting: (1) **geoscientific information** (e.g., geology, geochemistry, geophysics), (2) **technological information** (e.g., existing power plants, installed capacity), and (3) **social aspects** with a multi-scale approach (local, regional, continental) in order to define the origin and location of low to high enthalpy geothermal resources for the development of African electricity production, plus a range of direct heat/cold use applications and water use. **Results** will be made available through a **Geothermal Atlas for Africa (GAA)** printed and online, which will allow easy access to relevant information on geothermal resources for scientists, project developers, policy & decision makers, and investors. WP9 refers to the LEAP-RE Research area on the assessment of geothermal resource.

Relation to the PRE-LEAP-RE Multi Annual Roadmaps

The project aims to foster the long-term perspectives for geothermal development by considering the following road maps: (1) evaluation of priority joint research and innovation actions, (3) smart stand-alone systems, (4) renewable base-load electricity coverage for the African network, and (6) innovative solutions for priority domestic uses.

Concept, background and Ambition

Low to high enthalpy **geothermal resources** exist across the **African continent**, however, the **utilisation** is still **minimal**. East Africa has well-known high enthalpy geothermal resources due to its geological setting (East African Rift System). The potential for power generation related to this **favourable geological** condition is extensive, but geothermal development has (to date) been limited. Kenya is leading the development with an installed capacity of 690 MWe, largely at one site (Olkaria), demonstrating that larger-scale development of renewable energy resources can be done in this part of Africa. The current focus is mainly on high-temperature resources (i.e., East African Rift), while low-medium systems are neglected, despite the fact that they could provide sustainable heat/energy sources for industrial purposes, tourism, and others. If development of other large- and small-scale systems (both electrical and direct use) is to be achieved, then it is imperative that we have a sufficient understanding of (1) the many **geothermal resources** (from low to high-enthalpy) on the continent as well as (2) the existing **surface infrastructures** and (3) **social needs and specificities**. However, the current situation is that the knowledge in Africa is scattered on all three aspects. This project aims to implement a **Geothermal Atlas for Africa** by identifying collecting, compiling and (re)processing existing data to create an up-to-date Atlas that can be distributed in pdf format, and further developed

into a GIS (Geographic Information System) in a near future, to help identify the geothermal. Capacity building to enhance knowledge will contribute to the diffusion and longevity of this project.

Methodology

The project will be developed in two main areas:

(1) **Identification and gathering of existing data** and intensive **co-operation between African and European** partners (e.g. geological surveys, universities, ARGeo, WGC2020 country updates). This encapsulates geoscientific, surface installation, and social aspects.

(2) The **diffusion of the information** through (1) the processing, interpreting and illustrating these assessed information into the **Geothermal Atlas for Africa** and (2) the identification of knowledge gaps to be developed as courses and projects at the next phase.

In the initial phase of the project, the partners will **identify the data available** that could help define the geothermal potential. The information will comprise (but will not be limited to data on: geological structures and tectonics, magmatic processes, volcanic evolution, thermal anomalies, mineralogical evidence of hydrothermal alteration, fluid geochemical data, hydrogeology, and technical information. These data will be used to **categorise and assess resources** to be shown in the **Geothermal Atlas for Africa**. Additionally, human activities (industries, towns, etc...) and needs will also be considered. The last aspect will be focusing on social aspects. These data will not just be sourced from papers in scientific journals, but also from a larger resource available in reports and unpublished material (e.g. the reports from 'Kenyan Rift Valley Geothermal Programme' from the BGS between 1985 and 1992). Both **African and European partners** will have significant roles, as knowledge from all partners is required to identify relevant information and collect them.

For the second phase, all the information collected will be **characterised, processed, and interpreted**, to extract information relevant to geothermal occurrences and define key regions of interest based on needs and both surface and subsurface feasibility. **Geothermal Atlas for Africa** will display in a homogenised manner the present day knowledge of the available resources and potential utilisation. The creation of the **Geothermal Atlas for Africa** is the main diffusion outcome to share the result of this work, allowing all stakeholders to be support the development of geothermal energy on the African continent. Communication regarding the **Geothermal Atlas for Africa** and more focused work in both the scientific community (conferences and scientific journals) and to a broader audience will be developed.

In addition to these two main phases, a **capacity training needs** will be developed, based on knowledge gap identified during the creation of the atlas and course could then be developed in collaboration with existing **geothermal training** programs (e.g. UNU GTP). This will allow the identified knowledge gap to be filled and specific needs to be filled based on regional specificities (both from geological, infrastructure, and social needs). The creation of a **network for geothermal** resources assessment will also guarantee that the **Geothermal Atlas for Africa** remained live with newly information made available a-posteriori as it may be implemented further into a GIS form in relation with existing platform (e.g. Africa Geothermal Inventory Database from the UN, [Global Atlas for Renewable Energy](#) from IRENA).

AMENDMENT related to the excluded African partners (AU)

This amendment follows the KoM and the subsequent meetings among the EU partners that had got in charge the workload and budget of the African Union (**AU**) **excluded partners**, e.g. International Geothermal Association - Africa Regional Branch (**IGA-ARB**), University of Yaounde I (**UY1**) and Kenya Electricity Generating Company (**KenGen**). In compliance with the rules of the respective administrative boards, the consortium of WP9 found an internal agreement and is here proposing the redistribution of the workload and budget, the latter as resulting from the attached spreadsheet.

The documentation required by the EC to acknowledge the costs of the African excluded partners and eventually reincluded with the IN-kind formula could get them in troubles in producing documentation compliant with the EC accounting rules. For this reason, the Consortium of WP9 concluded that the level of possible non-compliance risk would be too high to go ahead with the initially proposed IN-Kind contribution of the excluded partners.

Thus, the Consortium of WP9 decided to proceed with a third African partner only, **United Nations Environment Programme (UNEP)**, which proposed its willingness to participate in WP9 GAA as an **international partner** of UNIFI, coordinator WP9. The International partner will work at no charge on the project, basically replacing the excluded AUs. The **extra budget** will remain **with the EUs**, which will use it to **recruit experts** (possibly in the **African areas of interest**, considering the importance of knowledge of local territorial, infrastructural and social conditions) to support UNEP in the workload excluded AUs.

UNEP management has agreed to participate in the project as an international partner, in terms of **Article 14A** of EU's Grant Agreement which specifies:

- International partners perform their action tasks directly and do NOT sign the Grant agreement with EC (and are therefore not beneficiaries).
- The project coordinator remains responsible towards the Commission/Agency for the action tasks performed by its international partner (e.g. UNEP).

Accordingly, UNEP Africa office will sign an agreement directly with the Project Coordinator to implement the project as per the identified project's Work Plan. This agreement will contain provisions (among others):

- That UNEP will provide only **in-kind contribution** in the form of **staff time**;
- All the costs related to the implementation of the project, except UNEP staff time, will be covered by the project coordinator; anyhow, in compliance with Article 14, UNEP will not be entitled to any reimbursement for costs incurring in work done in GAA Project;
- During the completion of the GAA project, UNEP will be recognized and acknowledged as one of the partners contributing to developing the Geothermal Atlas of Africa.
- The **actions of UNEP** in replacement of the excluded African partners are **reported explicitly** in the following detailed work plan.

UNEP will support the GAA project in coordination and providing:

- Relevant integrated geoscientific and engineering data and information, for both power generation and direct use application;
- Data and information on empowering of women and youth through injection of entrepreneurship in the geothermal energy sector where it had completed projects.
- Support on construction of the Geothermal Atlas in Africa and provide integrated WEB GIS based geoscientific data from the thirteen Africa countries.
- Coordinating and Provide information on home grown skill and capacity through the UNEP hosted IPCU-Africa Geothermal Center of Excellence; regional Networking, E-learning and Knowledge sharing in geothermal science and technology value chain through south-south cooperation;
- Coordinating the WP through regional networking and support project management related to the above activities reflected in Tasks 1-5.

Work Plan

The work plan will be logically divided in tasks, responding to the methodology above. For each task, European and African partners will be involved, with a leading and co-leading partner from each continent, as well as contributing partners and their respective timing in months. Specific equipment required is also mentioned. Tasks partly overlap each other as shown in the provisional time-frame proposed below.

1.1.1 Task 9.1.: GEOSCIENCES

(81.9 PM Excluded UNEP)

Task 9.1 Geosciences is dedicated to identify and collect all relevant existing geological data that allow subsurface characterisation of the low to high enthalpy geothermal systems in Africa with a potential for power generation and/or direct use applications. The information will be collected from existing sources based on a strong partnership between European and African partners. The data will be organised in a systematic structure for integration in Task 9.4.

Task Leaders: Egbert Jolie GFZ (EU) & Balemwal Atnafu AAU (AU)

Contributors: GFZ (21.4 PM), AAU (13 PM), UU (5 PM), TNO (5 PM), BGS (6 PM), BRGM (6 PM), CNR (6 PM), Géo2D (1 PM), DeKUT (2 PM), UDSM (1 PM), UEM (3 PM), NARSS (2 PM), ODDEG (4.5 PM), CDER (6 PM), **UNEP** (11 PM?)

Action 1: Development of systematic data collection and management structure

Sub-action1: Systematic data management for all relevant data

Responsible partner and PMs: GFZ and TNO (21.4 PMs)

Contributing partners and PMs: All Task 9.1 contributors GFZ (5 PM), AAU (3 PM), UU (1 PM), TNO (1 PM), BGS (1.5 PM), BRGM (1.5 PM), CNR (1.5 PM), Géo2D (0.25 PM), DeKUT (0.5 PM), UDSM (0.25 PM), UEM (0.75 PM), NARSS (0.5 PM), ODDEG (1 PM), CDER (1.5 PM), **UNEP** (3 PM?)

Description of steps and contributors: *To be coordinated with Task 9.4 Implementation of the Atlas, under consideration of existing data platforms*

Action 2: Data collection

Sub-action 1: Geological and structural data collection

Responsible partner and PMs: **GFZ** (20 PMs)

Contributing partners and PMs: All Task 9.1 contributors GFZ (10.4 PM), AAU (7 PM), UU (3 PM), TNO (3 PM), BGS (3 PM), BRGM (3 PM), CNR (3 PM), Géo2D (0.5 PM), DeKUT (1 PM), UDSM (0.5 PM), UEM (1.5 PM), NARSS (1 PM), ODDEG (2.5 PM), CDER (3 PM), **UNEP** (5 PM?)

Description of steps and contributors: *Identification of main geological/structural features that relate to geothermal systems*

Sub-action 2: Geochemical and hydrogeological data collection

Responsible partner and PMs: **GFZ** (20 PMs)

Contributing partners and PMs: All Task 9.1 contributors (x PMs)

Description of steps and contributors: *Identification of the hydrogeological conditions and geochemical characteristics in African geothermal resources*

UNEP: Support in the collection of existing relevant integrated geoscientific data (geology, geochemistry, hydrogeology and geophysics) from geothermal resources in the region: (i) Volcano-magma hosted (e.g. Eastern Branch of the EARS) ; (ii) Fault controlled and tectonically

active geothermal systems (western branch of the EARS) and (ii) those hosted by Sedimentary basins.

Sub-action 3: Petrophysical and thermal data collection

Responsible partner and PMs: **GFZ** (20 PMs)

Contributing partners and PMs: All Task 9.1 contributors (x PMs)

Description of steps and contributors: *Identification of information on the overall temperature distribution; Collection of petrophysical parameters for geothermal reservoir characterisation*

Sub-action 4: Geophysical data collection

Responsible partner and PMs: **GFZ** (20 PMs)

Contributing partners and PMs: All Task 9.1 contributors (x PMs)

Description of steps and contributors: *Identification of geophysical information that support the characterisation of the subsurface and improves the understanding of localisation and specificity of geothermal systems*

Action 3: Data organisation

Sub-action 1: Data treatment and homogenisation

Responsible partner and PMs: **GFZ** (20 PMs)

Contributing partners and PMs: All Task 9.1 contributors **GFZ (5 PM), AAU (3 PM), UU (1 PM), TNO (1 PM), BGS (1.5 PM), BRGM (1.5 PM), CNR (1.5 PM), Géo2D (0.25 PM), DeKUT (0.5 PM), UDSM (0.25 PM), UEM (0.75 PM), NARSS (0.5 PM), ODDEG (1 PM), CDER (1.5 PM), UNEP (3 PM?)**

Description of steps and contributors: *Relates to geological/structural, thermal, geochemical, geophysical, petrophysical data*

1.1.2 Task 9.2: ENGINEERING SCIENCES

(46.25 PM Excluded UNEP)

To compare resource availability and population needs by concentrating on the surface installation and potential usage of the geothermal energy systems.

This will involve using three kinds of information:

- 1) Characterisation of the **subsurface** (Task 1) for geothermal energy usage;
- 2) Feed information through to **'surface usage'** and **social** aspects (Task 3);
- 3) Development of geothermal energy that utilises **medium to low enthalpy sources**: identification and mapping of the existing direct use of heat and/or cold.

Task Leaders: Daniele Fiaschi UNIFI (EU) & Balemwal Atnafu CDER (AU)

Contributors: **UNIFI (30 PM), CDER (3 PM), TNO (1 PM), IEG (1 PM), CNR (1 PM), GFZ (2 PM), SU (3 PM), ODDEG (3 PM), UEM (1 PM), NARSS (1.25 PM), UNEP (10 PM?)**

Action 1: Data sources: from subsurface through surface usage

Sub-action 1: Geothermal energy RES/grid integration

Responsible partner and PMs: **UNIFI** (x 15 PMs)

Contributing partners and PMs: UNIFI (15 PM), IEG (0.5 PM), UEM (0.5 PM), ODDEG (1.5 PM.), NARSS (1.25 PM), GFZ (1 PM), CNR (0.5 PM)

Description of steps and contributors:

- *Assessment of the production of electricity feeding into national or local grid infrastructures through information tools such as the Open Source Spatial Electrification Toolkit (OnSSET)-; **UNIFI; CDER, ODDEG, NARSS, UEM***
- *Identification of geothermal systems (existing/or for possible development) for electricity: this section will map the existing systems and explore their development, also considering new technologies (e.g., non hydro-thermal systems). Mapping the potential for development of geothermal energy systems that utilise medium to low enthalpy fluids to identify area where the development of small-scale off-grid systems could be of interest; **UNIFI; CDER, GFZ, IEG, CNR, NARSS, ODDEG***
- **UNEP:** Support in collection of relevant geothermal related information (well data, power plants, direct use applications etc..) along the geothermal prospects in the Great East African Rift Valley.

Action 2: Assessment of different possible uses of geothermal energy in the AU

Sub-action 2: Investigation of suitable areas and activities for effective exploitation of different geothermal resources

Responsible partner and PMs: **UNIFI** (x 15 PMs)

Contributing partners and PMs: UNIFI (15 PMs), IEG (0.5 PM), , GFZ, CNR(0.5 PM), ODDEG (1.5 PM)

Description of steps and contributors:

- *Mapping of the existing direct use of heat and/or cold; **UNIFI; CDER, ODDEG, GFZ, CNR, IEG***
- *Industrial and recreational direct use: identification of the potential for developing industrial use of heat (e.g. food processing, fishing farming, green houses, water access, recreational activities) and/or cold (food preservation and processing, comfort climate control,...); **UNIFI; CDER, ODDEG, IEG***
- *possibilities of using storage of cold for direct and for power-boosting (extra cooling of the condenser); **UNIFI, CDER, ODDEG, IEG***
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1.1.3 Task 9.3: SOCIAL SCIENCES

(40.6 PM Excluded UNEP)

Socio – economic analysis and analysis of best practices to integrate with the Geothermal

Atlas for Africa and management data. The task will facilitate information availability, that will aid geothermal project development and implementation. This information will be useful for investors or project developers, when considering the most suitable socio-economic contexts for new geothermal investments. The data will be organised in a systematic structure for integration in Tasks 9.2 and 9.4.

The task will involve generation two kinds of information:

- a) Review of socio-economic context for analysis of African countries.
- b) Analysis of Case Studies of renewable energy development across Africa

Task Leaders: Joseph Onjala UoN (AU) & Fabio Iannone SSSA (EU),

Contributors: **UoN (17.6), SSSA (9.5), UNITO (9), UEM (2), NARSS (1.5), DeKUT (1) UNEP (1?)**

Action 1: Socio-economic analysis of context of the African countries

Sub-action 1: Collecting data on the Socio – economic context analysis for the African countries

Responsible partner and PMs: **UoN** (x 17.6 PMs)

Contributing partners and PMs: **UoN (10 PM), SSSA (5.5 PM), UEM (1 PM), UNITO (5 PM) DeKUT (0.5 PM) NARSS (0.75 PM), UNEP (0.5?)**

Description of steps and contributors:

Step 1: Development of data collection and management structure

- Developing a conceptual framework /concept note for the implementation of the task actions.
- Organise a workshop for the contributing partners.
- Developing data collection tools.
- Contributing partners and PMs: **UoN, SSSA, UU, UEM NARSS**

Step 2: Data collection

- Collecting data on socio-economic context from a range of African countries.
- Contributing partners and PMs: **UoN, SSSA**
- **UNEP:** Support in collection of data and information: (i) that will enhance geothermal project development and contributes to livelihoods of Communities (Women, youth, households etc..) both for Energy access and direct use applications that drives job creation and economic growth as a whole. (ii) Data and information on Renewable Energy Mix related to the regional energy integration for sustainable development. (iii) Data related to Policy, institutional and regulatory framework that drives the Renewable energy including geothermal resource development both at national, regional and community level will also be collected.

Step 3: Data organisation and analysis

- *Socio-economic analysis based on existing documents available at national scale from national and international databases;*
- *Contributing partners UoN; SSSA*

Step 4: Informing task 9.2 and 9.4

- *Identifying best practices analysis to integrate with the Geothermal Atlas for Africa and management data, to facilitate information availability.*
- *Contributing partners UoN; SSSA*

Action 2: Analysis of cases of renewable energy development across Africa

Sub-action 2: Identifying cases of geothermal – and potentially renewable – energy developments

Responsible partner and PMs: **UoN (7.6 PMs)**

Contributing partners and PMs: **UoN (MP7.6), SSSA, UU, UEM NARSS**

UoN (7.6 PM), SSSA (4), UNITO (4), UEM (1), NARSS (0.75 PM), DeKUT (0.5 PM) UNEP (0.5 PM?)

Description of steps and contributors:

Step 1: review of good practices implemented by various stakeholders

- *Collection of good practices implemented by various actors (e.g. multinational companies, state-owned companies, private consortia, etc.): desktop research and/or interviews to experts to gather information on the institutional framework;*
- *Contributing partners **UoN; SSSA, UU, EMU NARSS***

Step 2: identifying of the network of stakeholders and decision makers

- *Definition of the network of stakeholders and decision makers involved: existing national and international database will be explored;*
- *Contributing partners **UoN; SSSA, UU, UEM NARSS***

Step 3: assessment of institutional and regulatory framework

- *Assessment of institutional and regulatory framework that might hamper or favour the implementation of a project: existing national and international database will be explored;*
- *Contributing partners **UoN; SSSA, UU, UEM NARSS***

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Step 3: analysis of the socio-economic context

- *Analysis of the socio-economic context, as the basis for assessing project implementation: existing national and international database will be explored;*
- *Contributing partners **UoN; SSSA, UU, UEM NARSS***
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1.1.4 Task 9.4: IMPLEMENTATION OF THE ATLAS

(30.5 PM Excluded UNEP)

Use of all information available from the preceding Tasks to deliver the Geothermal Atlas for Africa. Assessment of the geoscientific knowledge required to successfully identify and develop geothermal systems, factors that help enable construction of existing installations in place (both for high and low enthalpy), considerations about infrastructural constraints and the social aspects of geothermal development.

Task Leaders: Jan Diederik van Wees TNO (EU) & Islam Abou El-Magd NARSS (AU)

Contributors: TNO (7 PM), GFZ (5 PM), AAU (1 PM), UNIFI (1 PM), UoN (1 PM), UU (1 PM), BGS (1 PM), BRGM (3 PM), CNR (0.5 PM), Géo2D (1.5 PM), ODDEG (2 PM), NARSS (2.5 PM), CDER (1 PM), IEG (1 PM), USDM (2 PM) **UNEP (5 PM?)**,

Action 1:

development of geothermal Atlas of African continent

Sub-action 1: Data collection and homogenisation

Responsible partner and PMs: **TNO (x 3.5 PMs)**, NARSS (x 1 PMs)

Contributing partners and PMs: GFZ (x 2.5 PMs), AAU (1 PMs), UNIFI (x 0.5 PMs), UoN (x 1 PMs), UU (x 1 PMs), BGS (x 1 PMs), BRGM (x 2 PMs), CNR (0.5 x PMs), Géo2D (x 1 PM), ODDEG (2 x PMs), CDER (x 1 PM), USDM (2 x PMs), **UNEP (3 PM?)**

Description of steps and contributors:

- *Collection of the information gathered and interpreted in this project in close connection with the effort that is being made in the previous Tasks 1, 2, & 3; **TNO; NARSS; GFZ, AAU, UNIFI, UoN, UU, BGS, BRGM, CNR, Géo2D, ODDEG, CDER, USDM, UNEP***

- Homogenisation of the data, following the collection from many sources; **TNO, NARSS, CNR**

Sub-action 2: Interpretation and Atlas construction

Responsible partner and PMs: **TNO (x 3.5 PMs), NARSS (x 1.5 PMs)**

Contributing partners and PMs: **UNIFI (x 0.5 PMs), GFZ (x 2.5 PMs), UU (x 1 PMs), BRGM (x 1 PMs), Géo2D (x 1 PMs), IEG (x 1 PM), UNEP (2 PM?)** all others in name

Description of steps and contributors:

- Interpretation of the data in view of possible use of geothermal energy in relation with the local needs and resources; **TNO; NARSS, UNIFI, GFZ, UU, BRGM, Géo2D, USDM**
- Construction of the Atlas, to make all findings available online and in print; **TNO, NARSS**

1.1.5 Task 9.5: RESEARCH MOBILITY AND CAPACITY BUILDING

(27.6 PM Excluded UNEP)

Creation of links between researchers and institutions in Africa and Europe, on paper (web) and in person, both in Africa and Europe.

Task Leaders: Isabella Nardini IEG (EU) & Elisante Mshiu UDSM (AU)

Contributors: **IEG (9.6 PM), UDSM (9 PM), GFZ (1 PM), UNIFI (1 PM), UoN (1 PM), UU (1 PM), BRGM (1 PM), CNR (0.5 PM), NARSS (1.5 PM), CDER (1 PM), Géo2D (0.5 PM), SSSA (0.5 PM), UNEP (2 PM?)**
(IGA-ARB 1PM, UY1 1PM)

Action 1: Organization of research mobility

Sub-action 1: Workshops and Training (on-line or on-site) on geothermal energy and transfer of knowledge

Responsible partner and PMs: **IEG (x 9.6 PM)**

Contributing partners and PMs: **IEG (9.6 PM), GFZ (1 PM), UNIFI (1 PM), UoN (1 PM), UU (1 PM), BRGM (1 PM), CNR (0.5 PM), NARSS (1.5 PM), CDER (1 PM), UDSM(9 PM), UNEP (2 PM?)**
(IGA-ARB 1PM, UY1 1PM)

Description of steps and contributors:

- Organisation of research mobility; **IEG, GFZ, UNIFI, UoN, UU, BRGM, CNR, NARSS, CDER, UDSM**
- Development of courses on geothermal energy and transfer of knowledge and experience from Europe to Africa and from one African country to another; **IEG, GFZ, UNIFI, UoN, UU, BRGM, CNR, NARSS, CDER, UDSM**
- Capacity building for African partners (research, community members, other stakeholders); **IEG, GFZ, UNIFI, UoN, UU, BRGM, CNR, NARSS, CDER, UDSM**
- Through the **UNEP hosted IPCU-Africa Geothermal Center of Excellence**, support in facilitating the regional and national geothermal training (online and on site) ;
- Through the **UNEP Biennial ARGeo conferences** (international/regional level) Serve as a regional hub for Regional networking and platform sharing results of research and scientific findings. It can also create links between researchers and institutions in Africa and Europe.

1.1.6 Task 9.6: PROJECT MANAGEMENT

(34 PM)

Management activity, developed in accordance and coordination with the WP3 Leaders (Pillar 2 coordinators) and in synergy with other WPs constituting the Pillar 2.

Task Leaders: Daniele Fiaschi UNIFI (EU) and Abdelkader Aiat-Ouali CDER (AU)

Contributors: **UNIFI (21 PM), TNO (1 PM), GFZ (2 PM), UoN (1 PM), SSSA (1 PM), IEG (1 PM), BGS (1 PM), BRGM (1 PM), CNR (1 PM), ODDEG (1 PM), NARSS (1 PM), CDER (1 PM)**

Action 1: *Project Coordination*

Sub-action 1: *Periodical meetings*

Responsible partner and PMs: **UNIFI** (x 21 PM)

Contributing partners and PMs: **UNIFI (21 PM), TNO (1 PM), GFZ (2 PM), UoN (1 PM), SSSA (1 PM), IEG (1 PM), BGS (1 PM), BRGM (1 PM), CNR (1 PM), ODDEG (1 PM), NARSS(1 PM), CDER (1 PM), NARSS (1 PM)**

Description of steps and contributors:

- **Task** leaders monthly reporting meeting (situation, regularity of the activities, issues...); **task leaders**
- Trimestral reporting meeting with presentations of the progress work and check of financial status; **all**, in sufficient advance on the Pillar 3 trimestral meeting

Sub-action 2: *Project monitoring to meet time and budget constraints*

- Respect of the delivery of the milestones and deliverable, in compliance with Pillar 2 program and schedules; **all**
- Financial reporting

Sub-action 3: *Project reporting to LEAP program*

- Coordination to contribute to dissemination actions other conferences; **task leaders, all**
- Outreach (contribution to project website population with the outcomes from WP9)
- Coordination of the Geothermal Atlas for Africa reporting to Pillar 2 leader and project general coordinator

Summary workload

Short name	Organization Name	Contact person	Person Months (PMs)						TOT PMs
			Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	
TNO	Netherlands Organisation for Applied Scientific Research	Jan Diederik van Wees/Joop Hasselman	5	1		7		1	14
GFZ	Deutsches GeoForschungsZentrum	Egbert Jolie	21,4	2		5	1	2	31,4
AAU	Addis Abeba University	Balemwal Atnafu	13			1			14
UNIFI	University of Florence	Daniele Fiaschi		30		1	1	21	53
UoN	University of Nairobi	Joseph Onjala			17,6	1	1	1	20,6
SSSA	Sant'Anna School of Advanced Studies	Fabio Iannone			9,5		0,5	1	11

UNITO	University of Turin	Alessandro Sciuillo			9				9
IEG	Fraunhofer Institute for Energy Infrastructures and Geothermal Systems	Isabella Nardini		1		1	9.6	1	3
UU	Utrecht University	Fred Beekman	5			1	1		7
BGS	British Geological Survey	Christopher Rochelle	6			1		1	8
BRGM	Bureau de recherches géologiques et minières	Bernard Sanjuan	6			3	1	1	11
CNR	Consiglio Nazionale delle Ricerche	Eugenio Trumpy	6	1		0,5	0,5	1	9
Geo2D	Ressources Géol. Pour le Développement Durable	Jacques Varet	1			1.5	0.5		1
SU	Strathmore University	Anne Wambugu/Izael Da Silva		3					3
ODDEG	Djiboutian Office of Geothermal Energy Development	Kayad Moussa	4,5	3		2		1	10,5
DeKUT	Dedan Kimathi University of Technology	Nicholas Mariita	2		1				3
UEM	Eduardo Mondlane University	Boaventura Chongo Cuamba	3	1	2				6
NARSS	National Authority for Remote Sensing and Space Sciences	Islam Abou El-Magd	2	1,25	1,5	2,5	1,5	1	9,75
CDER	Centre de Développement des Energies Renouvelables	Abdelkader Aiat-Ouali	6	3		1	1	1	12
UDSM	University of Dar es Salaam	Nelson Boniface / Elisante Mshiu	1			2	9	1	13
TOT			81,9	46,25	40,6	29	17,5	34	249,25
UNEP	United Nations Environment Programme	Meseret Teklemariam Zemedkun	0	11	10	1	5	2	0

1.2 Deliverables

Number	Title	Due Date	Responsible
D9.1	Presentation of a more detailed Plan of Activities for the whole WP9	7	UNIFI
D9.2	Final report of task 9.1 on geoscience data collected to be used in the Geothermal Atlas	36	GFZ
D9.3	Final report of task 9.2 on all surface data collected to be used in the Geothermal Atlas	36	UNIFI

D9.4	Final report on the social analysis and the related data developed in task 9.3 and to be used in the Geothermal Atlas	36	UoN
D9.5	Final version of the Geothermal Atlas for Africa	42	TNO
D9.6	Report on the capacity building actions	42	IEG Fraunhofer/UDSM

1.3 Milestones

Number	Title	Verification mean	Due Date	Responsible
M1	Launch of the project (WP9)	Kick off meetings minutes	4	UNIFI
M2	Progress Report regarding the geoscience information, surface information and social information gathered per country	Minutes of the WP9 regular meetings	15	UNIFI, GFZ, UoN
M3	Capacity building program	Capacity building actions performed	20	Fraunhofer IEG/USDM
M4	Progress Report regarding the preparation of the geothermal Atlas for Africa	Minutes of the WP9 regular meetings	30	TNO
...				

1.1 Interaction/synergies with other WPs

WP9 via the Project Leader, will participate to WP3 Activities as part of the Scientific Board of Pillar 2 and will work with the Pillar Coordinators to maximise synergies across the WPs in Pillar 2, either in terms of R&I and capacity building.

Number	Interaction description	Responsible
1	Project Management will be carried out in synergy with WP3 and the Pillar 2 Board Governance indications	WP leader
2	Information on the current capacity building /training activities within each WP9-WP16 will be valorised to increase the “impact” of each capacity building activity back to WP9-WP16	WP leader
3	Based on the sharing during the first months of LEAP-RE, a constant link on cross-cutting interests relative to Technological development, methodological approach, Modelling tools and other R&I related topics that will take place into WP9, WP10, WP11, WP12, WP13, WP14, WP15, WP16 is promoted in Task 3.1	WP leader

4	Scientific Dissemination will be carried out in agreement with the Scientific Dissemination Strategy defined in WP3	WP leader
5	Other dissemination activities will follow the guidelines provided by WP4 in the LEAP-RE Communication and Awareness Raising strategy	WP leader
6	Monitoring and Evaluation will be carried out receiving input from the M&E plan for Pillar 2 developed in WP3 and coordinated by WP5	WP leader
7	Financial Reporting will be managed by WP1 and supported by the WP leader and WP3 Leaders	WP leader

1.2 Risks

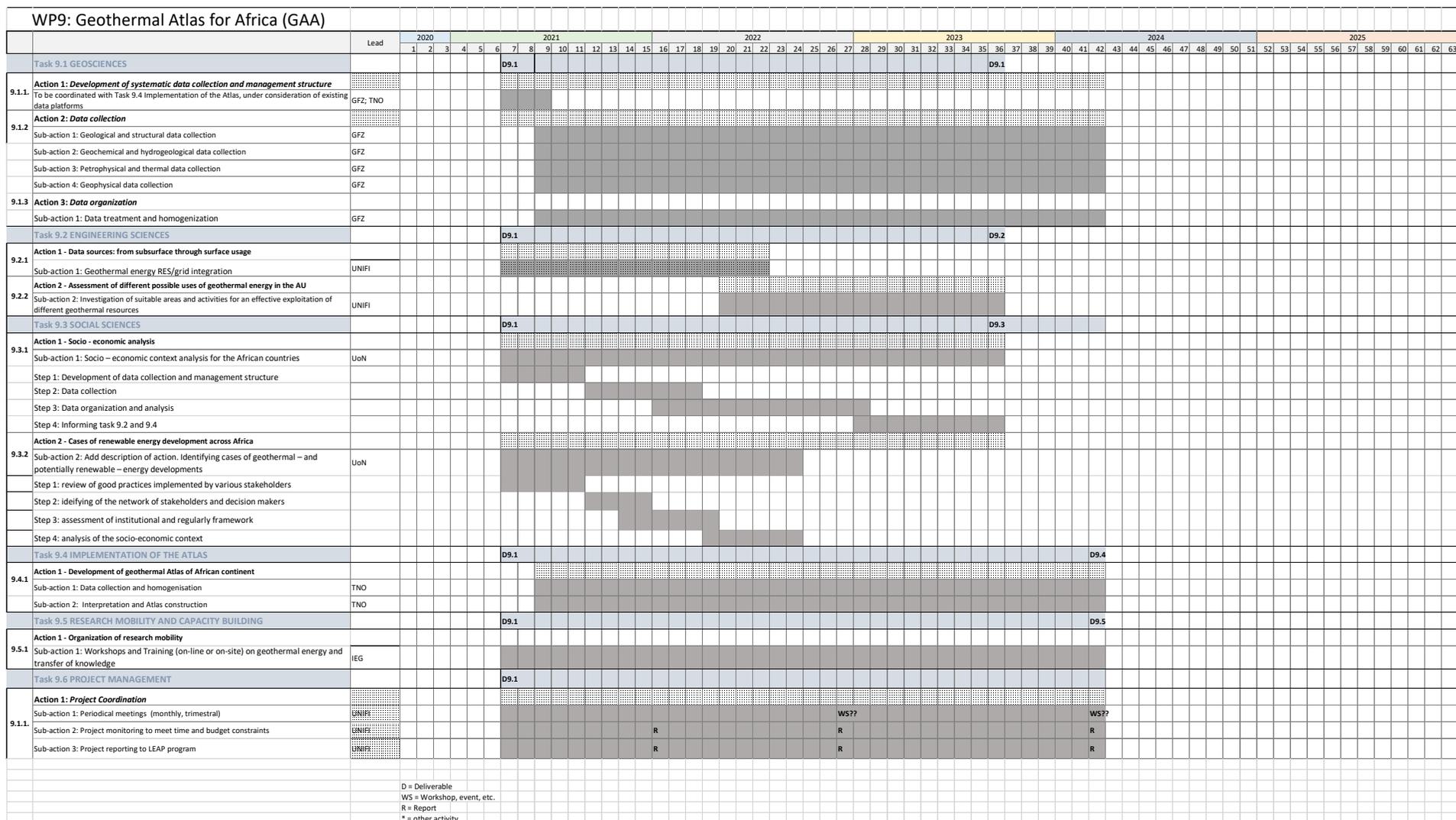
Contractual risks (number, description, risk-mitigation), probability (1=low; 5=high) that the risk occurs and impact (1=low; 5=high) if the risk occurs. Other risks (not in GA) can be added so they can be followed during the project. Risk mitigation: P=preventive actions / C=contingency actions.

Number	Risk description	Risk mitigation	Proba	Impact
1	Uncertainties linked to COVID pandemic Impact on collaboration modes	(P) The risk and impact will be monitored from the LEAP-RE perspective including during proposal evaluation (P) Use of virtual meetings (C) The programme is set to start in Apr. 2021	5	3
3	Manageability of very large consortium impact if it occurs Impact on Lack of alignment of some partners with programme objectives	(P) Programme coordination with the support of an assistant person to the WP9 leader, with sufficient dedicated time and effort to communication, schedules and organisation of meetings, mailing etc. (C) Organisation of general meetings with all partners allow to realign on objectives. Meetings will serve as an	4	3

		opportunity to consult the Pillar 2 partners and make sure that they are aligned with the project objectives		
4	Complexity of the programme structure Impact on Delays or even failure to deliver	(P) Solid managerial structure and work plan. (P) Detailed Work Plans with clear responsibilities for all	3	2
5	Increased risk of defaulting partners during 5 years Impact on Missing link possible and therefore missing functionalities, if input of one party is default	(P) A large majority of partners are only involved in 1-2 Tasks, which prevents any systemic risk (no domino effect) (P) Experienced programme coordination team (C) Access to large community allows to easily find partner replacements (C) Task leaders monitor risks and flag problems to enable timely mitigation	3	3
6	Problems in conflict Resolutions Impact on Delays, departure of a partner or failure to deliver the final product	(P) Develop continuous mutual trust. Regular Meetings (P) Conflict resolution process in Consortium Agreement (C) Perform a progressive de-escalation by reducing tension and building step-by-step solutions. Appoint a mediator(s) to solve conflicts	3	3
7	Weak partner commitment due to lack of physical meetings	(P) Use of virtual meetings is becoming the <i>new normal</i>	3	2

	Impact on Limited interaction among parties and commitment	(P) Organisation of regular monthly meetings with task leaders (P) Organisation of regular virtual trimestral meetings with all WP9 partners and increase of involvement of parties on common activities		
15	Financial difficulties by parties in WP9 Impact on Slowdown and delay of the research activities	(P) Continuous communication of the parties with the coordinator for financial planning and strong organisation of activities to minimise the risk (C) Adjustment with replacement or downscaling of the planned activities	3	3
16	Scarcity or lack of data Availability Impact: Need to recur to assumptions leading to less precision of obtained results	(P) Initiate dialogue with local stakeholders institutions, energy utilities to improve and ensure data exchange (C) Use of literature data and proxies to approximate and reconstruct necessary data. Massive survey activity to integrate lacking data.	2	2
17	Uncertainties linked to COVID pandemic Impact on the mode, distribution and effectiveness of the capacity building actions (research mobility, workshops and training)	(P) Virtual workshops and training (C) Appropriate planning of the actions enforced by the co-leading of EU-AU partners	5	3

Annex 1: WP9 GANTT Chart



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