**Concept Note for ZSI-MESRS input to the deliverable**

***Analysis, benchmark, and mapping on R&I capacities in Africa* (D5.8)**

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| Project | LEAP-RE |
| Project Number | 963530 |
| Deliverable Number: | D5.8 |
| Deliverable Title | Report on the analysis about R&I capacities in Africa / Analysis, benchmark, and mapping on R&I capacities in Africa |
| Responsible project partners | MESRS + ZSI |
| Due date | March 2022 |
| Dissemination level | Public |
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# References in the project contract

The development of the activity is embedded in WP5, Task 5.3 - see below for the full text and highlights for the reference to the concrete work towards D5.8. Within D5.8, a scientometric study and mapping is planned with a due date in **June 2021**.

## The relevant Work Package and Task

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| **Work package Number** | WP5 |
| **Work package Title** | Long-term perspective |
| **Task Number** | T5.3 |
| **Task Title** | Monitoring research and innovation cooperation |

**Overall objective of WP5:** WP5 develops the long-term perspective for the AU-EU partnership in RE STI. The success of sustainable development in Africa and Europe lies in addressing the energy challenges tasks defined in the SDG Agenda 2030 and, in particular for Africa, “Agenda 2063: The Africa We Want”. In collaboration with Pillars 1&2, WP5 will make a review of LEAP-RE projects and **a scientometric study of research capacity and training infrastructures** to highlight the gaps to solve the sustainable energy problems in Africa. The desired changes in R&I and capacity-building agendas will be defined together with the expected impact pathways. An M&E concept will be designed towards a short-term output assessment and a long-term outcome and impact assessment. Policy stakeholders will be engaged in dialogues for research and innovation uptake. A strategy for further strengthening R&I capacities and mutualising infrastructure in Africa will be formulated. Finally, the overall LEAP-RE process will be empirically studied for designing a long-term inclusive collaboration model, including mechanism for research uptake.

**Task 5.3: Strategy for RE research-capacity in Africa** (Co-leaders: MESRS, ZSI; Contributors: DLR-PT, PAUWES, DSI, SU) (M3 to M63). This task addresses innovative models of cooperation for R&I capacity-building. African strategic agendas will be analysed and selected activities in the field of RE will be benchmarked. The target is to support new (or existing) mechanisms which may involve networking, teaming (by creating centres of excellence), twinning (institutional co-supervision, post-doctoral programmes), and sharing infrastructures. The framework of such vision was declined in the new Africa-Europe Alliance for Sustainable Investment and Jobs, Horizon Europe and the new Research Framework Programme for the period 2021-2027 that open up new opportunities in the join AU-EU strategy (5th SOM, AU-EU HLPD on STI). Agenda Analysis (M1 to M6): Comparison of the SDG Agenda 2030, the Agenda 2063 « Africa we want », including STISA (2014-2024) objectives in RE-related capacity; Benchmarking (M1 to M12): Benchmarking the LEAP-RE projects in Pillar 1 and 2, other projects (e.g. FP7-ERAfrica, MED-Spring, H2020 projects in sustainable energy involving African partners), to identify African capacities and institutions related to RE. This work will be conducted to identify some research institutions which will initiate the long-term partnership in RE; **Mapping of African capacities (M1 to M6): A general mapping of African R&I capacities will be undertaken, relying on the partner base from Pillars 1&2, as well as sources such as Thomson Reuters’s Web of Science high ranked scientific journals. This scientometric study will complement the benchmark to create a global mapping that better illustrates the African potentialities;** Twinning, teaming and pooling (M6 to M60): Deliver virtual networks of academic communities in RE, with mechanisms for linking scientists and institutions that are committed to working together based on these three collaboration instruments: – Twinning in post-doctoral programmes: institutions of the network receive researchers selected to conduct a specific task; – Teaming supports the creation of new (or upgrading of existing) Centres of Excellence in partner countries. This mechanism is inspired from Horizon 2020 “Teaming for Excellence” programme to transfer experience from Europe’s top research centres to the new EU MS; – Pooling of resources provides access to world-class infrastructures to do cutting-edge research in partnership with European institutions depending on their internal legislation.

*In more details the work will be undertaken following the* *five next steps:*

*(1) Analysing African strategic agendas in RE [SDGs, Africa2063, STISA] and Selecting activities in the field of RE [Areas or research and innovation, research programs, keywords]*

*(2) Benchmarking AU-EU R&I in RE [by domain and by African regions based on bilateral scientific cooperation, identified keywords]*

*(3) Mapping and visualising results of networks [nodes are countries, institutions]*

*(4) Identifying R&I partnership [Institutions, training programmes, pooling or access to Infrastructures].*

***(1) Analysing African strategic agendas in RE [SDGs, Africa2063, STISA] and selecting activities in the field of RE [Areas or research and innovation, research programs, keywords]***

**1.1] SDGs and African Agenda Analysis (M1 to M6):** Comparison of the SDG Agenda 2030, the Agenda 2063 « Africa we want », including STISA (2014-2024) objectives in RE-related capacity

Goal 7 of the SDGs aims at achieving universal access to affordable, reliable, sustainable and modern energy by 2030, while Agenda 2063 (including STISA objectives) has targets for an increase of 50% in electricity generation, 50% distribution and 70% of Africans having access to electricity by 2023. But the growth of Africa’s sustainable development is underpinned by a set of target categories connected to Renewable Energy, with strong level of relevance.

- SDG1: Poverty and Development

- SDG3: Disease and Mortality

- SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

- SDG5: Achieve gender equality and empower all women and girls

- SDG6: Ensure access to water and sanitation for all

- SDG7: Ensure access to affordable, reliable, sustainable and modern energy

- SDG9: Inclusive and Sustainable Industrialization

- SDG11: Make cities inclusive, safe, resilient and sustainable

- SDG12: Ensure sustainable consumption and production patterns

- SDG13: Take urgent action to combat climate and its impacts

**1.2] Selecting activities in the field of RE [Areas or research and innovation, research programs, initiatives, keywords]**

For each Agenda2030 SDGs AND/OR Africa2063 target an excel file is under construction including the following information’s:

1. Targets linked to renewable energy and its relevance [strong, high, weak]
2. Associated keywords or string
3. Which RE technologies could solve [1. Solar Photovoltaic Energy, 2. Wind Energy, 3. Energy Efficiency in the Building, 4. Solar Thermal Energy, 5. Marine energy, 6. Storage of Energy, 7. Geothermal Energy, 8. Bioenergy, 9. Hydrogen and Fuel Cells, 10. Hydroelectricity, 11. Materials **:** (industrialization of certain components of renewable energy systems such as solar panels or wind turbine blades)].
4. Current African initiatives and Feedback of visible implemented programs or actions, based on reports on STISA or Africa2063 Evaluation process

**(2) Benchmarking (M1 to M12):**The benchmarking process is used to identify and analyze previous projects to determine their impact on the local or regional community, and to identify the human capacity as potential resource for R&I.

***2.1) Benchmarking the LEAP-RE projects in Pillar 2 and the coming projects in Pillar1.***

To identify how LEAP-RE projects could be connected to AU-EU R&I needs, we’ll first use a matching process and comparison between the objectives of the six multi-annual roadmaps, thanks to the associated keywords, the technical keywords identified in the matrix of step [1] and the selected programs in Pillar2. This action will be completed next December 2021 based on the projects which will be accepted and funded under Pillar1.

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| *Multiannual roadmaps* | *PillarII projects* | *Keywords* | *Connexion to matrix (step1)* |
| ***Example with Multiannual roadmap 6….*** | | | |
| 6: Innovative solutions for priority **domestic uses** (clean cooking and cold chain) | WP10 PURAMS, solar cooking, standalone solar cooker, silicon solar cells, | clean cooking; energy poverty; improved cooking stoves; Electric clean cooking, Improved cookstove, Solar cooker, Cold chain, Supply chain, Cold chain logistics | saves health, time and money [SDG1], job opportunities [SDG8], Reducing smoke emissions, air pollution [SDG3], climate vulnerability [SDG11], girls kept out of school [4], etc… |

***2.2) Benchmarking (M1 to M12): AU-EU past projects (e.g. FP7-ERAfrica, MED-Spring, AU Grant projects and H2020 projects in sustainable energy).***

The characteristic of the R&I partnership is to strive to integrate research and innovation activities that have an impact on citizens. Thus, it will be assisted by the valuable lessons learned from projects developed or underway in the field of sustainable energy; these are AU grant projects in renewable and sustainable energies, or EU projects. We can mention, but not limited to AREI (Africa Renewable Energy Initiative (AREI), CSP4Africa (Development of a cost-effective, modular and dry concentrating solar power for Africa), REELCOOP (REnewable ELectricity COOPeration), SOLPART(High temperature Solar-Heated Reactors for Industrials Production of Reactive Particulates), ECOWAS observatory for renewable energy and energy efficiency, EUROSUNMED  “Euro-Mediterranean Cooperation on Research & Training in Sun based Renewable Energies.. ”, etc. This overview of two binary digit research programs offers particularly to identify the gaps of research and cooperation activities, which is an issue of high priority to the EU-AU R&I Partnership in RE.

**3) Mapping and visualising results of networks in RE (nodes are countries and/or institutions)**

***3.1) Visualising LEAP-RE network partners (Institutions involved in Pillar1, Pillar2, Pillar3).*** This exercise is just to illustrate graphically the link between research teams and institutions for mobility or access to the infrastructures. Nodes providing services as sharing infrastructures will be highlighted with indication of the scientific equipment.

***3.2) Scientometric analysis of high ranked publications of African researchers*** and their partners in renewable energy using **Clarivate’s Web of Science** data bases

Facing RE priorities requires analyses based on credible data and the involvement of institutional leaders in the public- and private sectors, along with a mobilization of the RE community. Within this framework we’ll work to establish a mapping of the knowledge sharing and transfer to sustain the innovation process in African countries.

This mapping will cover the identification of scientific networks and publications, as well as universities, faculties and research teams. In addition, investigating existing cooperation and its development over time as well as the identification of the most visible actors will facilitate the elaboration of the road-map in areas of common interest for medium and long-term-milestones and between African and European Research and Innovation communities.

It is important to identify scientific researchers in Africa, by country and by region, not only in RE, but the mapping will be extended to sub or connected areas as reported in the matrix (ref SDG4, … , SDG9, SDG11).

For the identification of regions, we shall adopt the United Nations geoscheme for Africa: North Africa, West Africa, East Africa, Central Africa and Southern Africa. For each country we’ll give a general overview of top 15 institutions, top 15 countries of co-publishing and top 15 leading scientists. We’ll summarize these results in some graphics to show the regional and continental map of scientific capacities and the importance of the links between these communities.

Our instrument of work is the web of science (WOS), a search and discovery platform for more than 7,000 academic and research institutions. It is a product of “Thomson Reuters Institute of Scientific Information” (ISI) and includes above 12,000 high impact journals and 16.000 conference proceedings, reports, and book series. Publications in [WoS](https://fr.wikipedia.org/wiki/Web_of_Science) are classified in 254 categories or 152 Research Areas. Additional useful metrics are sources/journals, authors, affiliation institutions, affiliation countries, citations, funding agencies, organizations, editors. It is important to highlight that in our search we’ll focus only on European, African, and international institutions .

Embedded analysis tools help to refine results, identify top authors, institutions, and publishers in a given field, trace citations, facilitate discoveries and connections across disciplines, regions and institutions. The methodology will be explained first then the limits of such work. The output will be first a general map showing the potentiality in research for each African country/region.

This work will be conducted for each multiannual roadmap in RE with recommendations and/or indicators on building and/or upgrading research infrastructures, enhancing professional and technical competencies based on the national policy if such strategy exists. Collaborative effort between researchers from both continents will be proposed as an option for developing the needed knowledge capacities for maintaining and strengthening long term collaborations by teaming and twinning actions.

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| **Examples of search queries about MAR 6 for North African region. This search query is to execute for each pillar AND for each African region + specific top 10 countries depending on the number of records and publications.** | | |
| ([TS = (cocking or ”clean cooking” or “cooking stoves” or “Electric clean cooking” or “Solar cooker”)]) | AND CU= (Algeria or Egypt or Libya or Morocco or Tunisia or Mauritania) | ***OUTPUTS:***  *- Graph mapping will be established* by adopting the approach of visualization of similarities using optimized algorithms from [VOSviewer](https://www.vosviewer.com/) 1.6.5 and  *Gephi Sotware, etc..*  *- ranking and analyse by country, funding agencies,* affiliation institutions, authors  - identification of research teams on specific thematics in RE and their position (ranking) in Africa |
| ([TS = (“Cold chain” or “Supply chain” or “Cold chain logistics”)]) | AND CU= (Algeria or Egypt or Libya or Morocco or Tunisia or Mauritania) |

The input report outlines the bibliometric analysis of scientific publications on *Renewable Energy (RE)*  that have been authored or co-authored by researchers affiliated with African institutions to, firstly, describe the activity related to different RE categories in different regions of Africa and, secondly, to present the most active players, centres of excellence, and existing “hot” links between institutions through the analysis of the most visible co-publication links. Consequently, the analysis will cover a development over time (2015-most recent) to be able to reinforce the arguments about strength and weaknesses related to RE research in Africa by also providing evidence on recent dynamics. Furthermore, the report will put these strengths and weaknesses into the global context.

The results of the bibliometric analysis will be presented in digestible formats, such as factsheets, tables, charts, or descriptions, so that readers will gain a comprehensive understanding of the respective RE development in Africa. Visualisations will be created for bibliometric data whose purpose is to present the analysis results in a more intuitive way as is possible by conventional means. Part of those visualisations can be presented online and interactive to allow the target audience to explore the data according to their own interests.

**(4) Identifying R&I partnership [Institutions, training programmes, pooling or access to Infrastructures].**

**4.1) Analysing identified nodes of the network and moving to a long-lasting partnership:** Strengthening and maintaining research capacities are the fundamental pillars to generate knowledge, facilitate learning and co-develop innovations in sustainable energy. A comprehensive approach is needed to build research capacity and institutional strengths particularly in Africa. We have identified a set of mechanisms (twinning, teaming and pooling) to launch after undertaking an audit where such research infrastructure collaboration will be most profitable. The first step will be to prepare a questionnaire to identify which actions are possible, when, with which means (not necessarily funding) and with who.

**- Preparation of a swot / questionnaire / round tables with identified and selected partners in both continents.**

These actions will be explored with selected and willing institutions engaged for the future Europe-Africa cooperation. They are to develop.

## Relationship to other WPs in LEAP-RE

Apart from contributing to the objectives of the WP5, namely, addressing energy challenges and highlighting the gaps to solve the energy problems in Africa through a scientometric study of RE-related research capacity, the deliverable also offers a specific mapping of Pillar II projects by conducting the different analyses as defined in 2.1. Pillar II projects and later Pillar1 projects will constitute the basis for applying strategies to s*trengthen existing mechanisms or launching new mechanisms for networking*

*- teaming (by creating centres of excellence),*

*- twinning (institutional co-supervision, post-doctoral programmes),*

*- sharing infrastructures.*

## Desired impact

Beyond the internal effects in WP5, for the development of a long-term strategy, and synergies created for other project activities, the report shall have an impact on external actors. A few examples of those cases would be; policy- and decision-makers who aim to widen their knowledge for their agenda-setting efforts, institutional and governmental bodies who are seeking thematic or regional prioritisation for funding decisions, academicians and academic organisations with the intention to create a better perspective about the research on RE. In this regard, the impact can be enlarged by effectively communicating and disseminating the results and increasing accessibility both for internal actors involved in the project and external actors trying to gain insight into the RE research in Africa.

# Outline of the ZSI input to D5.8

## Overall objective

The objective of this activity is to map and analyse R&I capacities in Africa focusing on the most visible players and centres of excellence.

## Estimated Result

The draft structure of the input report is as follows:

* Executive summary
* Introduction
* Methodology
* Results
  + Overall numbers (presentation format) incl. global comparison
  + Country profiles (presentation / factsheet format in the Annex or online reference)
  + Highlighting most visible actors and comparison between regions / countries/ institutions
  + Analysis of different RE categories or scientific fields
  + Highlights and interesting practices
  + Analysis of the RE-related collaborations between countries and institutions (most visible co-publication relations)
  + Analysis of the RE development over time in selected countries
* Visualisations (possibly in form of online interactive tools)
* Proposal for a questionnaire to the identified key stakeholders, to validate and complement the insights gained from the bibliometric evidence
* Conclusions and outlook

## Input / Process / Implementation

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| **Step** | **Activity** |
| 0 | collection of RE-related keywords |
| 1 | data acquisition |
| 2 | data normalisation and processing |
| 3 | bibliometric analysis |
| 4 | report and visualisation |

RE has a broad spectrum of different categories as well as a number of scientific fields associated with it. Therefore, detecting RE-related publications based on a citation database like *Web of Science* is not a straightforward process. In order to identify the parameters which would allow us to pinpoint RE-related publications without excluding any RE-categories (or, vice-versa, without including any false positives), a set of keywords that reflects the scope of RE is needed (**step 0**).

The following methods will be applied to collect the keywords to effectively identify the RE-related publications:

* Discussions with key project partners (in particular coordinator / WP lead / co-task lead) and mail to all partners to share relevant keyword lists and to validate relevant categories.
* Analysis of LEAP-RE documents (such as calls, research agendas, other available publications).
* Scientific publications about the contemporary state of different categories and scientific fields related to the RE research will be analysed. Keywords included in the RE-related publications will be extracted and, after the algorithmic clustering of the frequently occurring keywords, a manual elimination will be applied to create the final set of keywords.

Categories and keywords acquired from these methods are to be used in the data acquisition (**step 1**) process on the *Web of Science.*

ZSI will rely on its bibliometric expertise that they acquired through the conduction of more than 20 bibliometric studies during the past decade. As bibliometric input, *Web of Science* will be used as one of the two major bibliometric index databases.

Data normalisation and processing consume the major part of the resources available for bibliometric analysis. The sub-activities are as follows (**step 2**):

* Import of raw data
* Normalisation of the institution, country names, and other metadata
* Validation of bibliometric records
* Categorical distinction of different renewable energy topics
* Attribution to individual scientific disciplines in RE research

The following points will be emphasised in the bibliometric analysis (**step 3**) process:

* Most visible institutions, countries, centres of excellence
* Analysis of the scientific publications related to different RE categories or scientific disciplines
* The most visible links among countries and institutions through co-publication connections
* Contextualise RE-related research output on a global level by comparing with global players such as US, the EU or China
* RE development over time in selected countries

The last step includes data visualisation and report writing.

## Time Planning

In order to prepare the input in the first half of 2021, the following timeline has been foreseen:

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| **Step** | **Activity** | **from – to** |
| 0 | collection of RE-related keywords | M2-3 (Feb/March. 2021) |
| 1 | data acquisition | M3 (March 2021) |
| 2 | data normalisation and processing | M4 (April 2021) |
| 3 | bibliometric analysis | M4-5 (April-May 2021) |
| 4 | report and visualisation | M6 (June 2021) |

# Team

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