International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Institutional Practices in Moroccan Clusters in Favori of Innovation: Case of the "Solar Cluster"

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Abstract: ***The objective of this article is to present the institutional practices implemented by the governance units in Moroccan clusters, to facilitate the emergence and rapid dissemination of innovation within these agglomerations. And to achieve this, we have chosen to study the case of a cluster that operates in the renewable energy sector, this is the "solar cluster". Firstly, we will try to characterize the cluster according to the trend of innovative clusters, secondly we will highlight the institutional practices used by this cluster, and finally we will determine the type of governance practiced by the cluster object of our study.***

Keywords: Cluster, innovation, governance, institutional practices

1. Introduction

The Moroccan government's initiative to Make innovation a key factor of competitiveness, Make Morocco a technology-producing country as well as the exploitation of these R&D capacities, make the country an attractive destination for talents and R&D, and propagate the culture of innovation and entrepreneurship. The objective of the emergence of clusters in Morocco according to the Ministry of Trade and Industry is to help set up projects, monitor and support projects, help promote results, monitor clusters with significant development strategy for their sector. In our case study, we want to examine the extent to which this policy contributes to the development of innovation, by highlighting the institutional and governance practices used by the "solar cluster" which is the subject of our study. But we will initiate our article by characterizing the cluster according to the trend of "innovative clusters".

1.1 Characterization of the "Solar cluster" according to the current of innovative clusters:

This current considers knowledge as externalities accessible to all members but as strategic resources that develop only through frequent interactions between cluster companies (Arikan, 2009). This knowledge-based approach explicitly shifts the raison d'être of clusters from economic development to innovation, and national and regional innovation systems remain a key area of economic analysis. it is above all supporting the work of institutionalists around national innovation systems which are based on the growing importance of the influence of the national education system, industrial relations, technical and scientific institutions, government policies, traditions cultural institutions and many other national institutions is fundamental (Freeman, 1987; Lundvall, 1992) then regional, or Learning Regions (Florida, 1995; Morgan, 1997). View of Cluster (hereafter called KBVC), otherwise the knowledge-based cluster vision, which considers knowledge as the strategic resource of the cluster (Bahlmann and Huysman, 2008).

As a result, we can say that "the solar cluster" joins the trend of innovative clusters. In partnership with professional federations and academic educational and research establishments, "the Solar Cluster" launched in April 2014, as an innovative and ambitious association bringing together national players in the solar sector. The creation of the "Solar Cluster" reinforces the actions carried out within the framework of the Moroccan solar plan and aims to deepen the synergies between the actors of the sector in order to promote the emergence of a competitive solar industrial sector in Morocco. As well as the major objectives relate to capacity building and the development of industrial skills in the field of clean technologies, including in particular applications enhancing solar energy. The ambition of this solar cluster is to instill the culture of innovation and entrepreneurship and to share it with cluster members. Its role is also to accompany and support innovative projects, in order to strengthen the competitiveness of Moroccan companies. the first challenge to be met lies in the ability to transform Moroccan entrepreneurs into true producers of technologies, while relying on national skills in terms of Research and Development.

The "solar cluster" is also involved with its members in skills development and industrial capacity building. The wide range of services offered by the "Solar Cluster", particularly in terms of education, spin-off or training programs, is adapted to market changes and meets the needs of manufacturers, while supporting them throughout their journey. upgrade process.

1.2 The "solar cluster" is made up of:

a) A college of electricity, electronics and renewable energy companies

- CENTRELEC, Represented by Mr Ali EL HARTI
- TEMASOL, Represented by Mr. Roberto Crescitelli
- CLEANERGY, Represented by Mr. Mohammed TAJDDINE LASRY
- NRJ International, Represented by Mr. Ahmed SqualliHoussini

A college of companies in the metallurgical, mechanical and electromechanical industries:

- AIC METALLURGIE, Represented by Mr Mohamed ABDERRAZAK SERGHAT
- DLM, Represented by Mr Eric CECONNELLO
- CHANTIER ATELIER DU MAROC, Represented by Mr. Chafiq ESSAKALI HOUSSAINI
- LSA INDUSTRIES, Represented by Mr Najib CHERAI

College of Consulting and Engineering Companies:

- ADI, Represented by Mr. Ahmed ILOU

College of Building and Public Works Enterprises:

- CEGELEC, Represented by Mr Ahmed RAHMANI Business

College of Building Materials Industries:

- CIMENTS DU MAROC, Represented by Mr Omar Abbaro

College Public or private higher education :

- UNIVERSITE INTERNATIONALE DE RABAT (UIR), Represented by Mr. Noureddine MOUADDIB
- CADI AYYAD UNIVERSITY, Represented by Mr. Hassan Hbid

b) Vision and ambition:

Beyond its energy production dimension, the Solar Plan embodies the ambition of developing a clean socio-economic sector, sustained green growth, and this, through support for the development of a Moroccan industrial fabric. strong, the deployment of R&D and the strengthening of skills. In this context, the solar cluster contributes to the creation of synergies between public and private actors, entrepreneurs and researchers, with the aim of promoting the emergence of a competitive industrial sector in Morocco.

"The missions of the cluster revolve around 3 main axes":

1) Contribute to the creation of wealth in the energy sector by:

- The creation of a competitive and qualified industrial fabric, able to support and meet the needs of the national strategy for sustainable development and in particular ENR.
- Support for the creation of companies in the renewable energy and green technology sector.
- Contribute to the socio-economic development of territories through the enhancement of sustainable resources.

2) Anticipate and support the sector:

- Promotion of R&D and technological development through collective / collaborative projects and partnerships.
- Creation and maximization of "Industry-Academy-Finance" synergies.
- Facilitating access for students, researchers and young professionals to existing networks.
- Promotion of entrepreneurship and support for the creation of innovative start-ups.

3) Promote skills:

- Promotion of technological excellence of local skills with public or private contractors.
- Representation of companies and professionals with international organizations and support for the export of national expertise.
- Dissemination and promotion of national know-how in renewable energy and green technology at national and international level.

c) Territorial anchoring at the organizational level:

In the current of innovative clusters, we speak of a territorial anchoring on two levels, organizational and individual. Based on the relationships between individuals and establishing links between the organizations to which they belong these individuals, the existence of local inter-individual networks encourages localized exchanges between organizations (Grossetti, 2008). Writings are based on the learning capacity provided by belonging to a network and the social control that it engages, in particular through the mutual trust generated: “the network constitutes a form of voluntary cooperation which involves both information sharing and / or mutual learning as well as exchange between their members, and also social control ”(Johannisson et al, 2002, p. 298). The transfer and creation of knowledge between organizations are all the more important when the companies are geographically close: on the one hand, because the opportunities for meetings, in particular informal, and the frequency of interactions are more important (Saxenian, 1994; Bell and Zaheer, 2007), and on the other hand the managers of companies evolving in the same geographical area and share mental models of management thing which facilitate the understanding and the sharing of circulating information. For the "solar cluster", the territorial anchoring takes the form of:

- The creation of a competitive and qualified industrial fabric, able to support and meet the needs of the national strategy for sustainable development, and in particular for renewable energies.
- Support for the creation of companies in the renewable energy and green technology sector.
- Contribute to the socio-economic development of territories through the promotion of sustainable resources.

1.3 Institutional practices at the service of innovation within the "solar cluster":

1)Definition of institutional practices:

Institutional practices are understood as "a set of common habits, norms, routines, established practices, rules or laws which regulate the relationships and interactions between individuals, groups and organizations" (Edquist et al. Johnson, 1997, p. 42). According to Arikan (2009) three main factors that can prevent knowledge creation in clusters:

- lack of opportunities for knowledge exchange,
- the futility of these exchanges,
- and the lack of an institutional environment conducive to cooperative relations.

The learning dynamics within the cluster need an environment in which trust and standards of cooperation prevail. Certain works, around the concept of institutional

work (Lawrence and Suddaby, 2006), focus on the intentional actions that actors, individual or collective, carry out in order to influence the environment in which they operate. The interest of the analysis of the concept of institutional work is to reintroduce the strategic dimension associated with the actions of governance to influence its environment (Barabel et al., 2006), without forgetting the identification of obvious practices that governance can mobilize within the framework of clusters (Lawrence et al, 2009) and which we will see in the next chapter. Our goal is to bridge the gap between institutional practices and governance within the cluster for innovation. This objective will be achieved through the presentation of an analytical framework developed around the concept of institutional work proposed by Lawrence and Suddaby (2006), which will allow us to integrate the institutional and governance practices developed in the clusters.

Lawrence and Suddaby (2006) identify nine sets of institutional practices grouped under three main dimensions: the political, normative and cognitive dimension.

For the political dimension echoes the mode of regulation of the collective actions of the actors, while the normative dimension calls for the mode of coordination, and the cognitive dimension addresses the mode of knowledge management. We present the structural determinants below the main characteristics of these three perspectives and sets of institutional practices.

2) The political dimension of institutional work:
In this dimension of institutional work, the establishment of the constitutive rules of membership and regulation of relations between the very heterogeneous members of the cluster is essential. So we will verify the existence of all the practices that constitute the political dimension, namely:

- Persuasion practices
- The establishment of constitutive rules
- The regulation methods

A) Persuasion practices The solar cluster is characterized by a very strong involvement of public actors in its governance, AMEE Moroccan Agency for Energy Efficiency, is a strategic public institution, whose mission is to contribute to the implementation of the national energy policy, aiming reducingenergy dependence and preserving the environment, through democratization and the promotion of energy efficiency.

SIE Also known as Super ESCO or State Esco, the Energy Engineering Company is a State energy services company, a public instrument which aims to sustainably reduce the energy consumption of public and private organizations while improving their energy performance. it is also the financial arm of the State for the renewable energy sector and energy efficiency. In this spirit, its mission was to finance and co-develop national programs, and clean energy projects in "the solar cluster" of which she is also a member of the scientific committee. MASEN (Moroccan Agency for Renewable Energies) a dedicated organization to optimize its action, MASEN has branched out and has initiated a process of equity participation. In addition, Masen initiated the creation of the solar cluster, which will soon be extended to all renewable energies.

"[...] Our objective is to contribute to capacity building and the development of industrial skills in the fields of solar energy and green technologies. By mobilizing professional organizations, industry, researchers and academics, we bring together multiple resources and skills, encourage collaboration and cooperation and promote the emergence of synergies between public and private actors. " Mustapha Bakkoury, Chairman and CEO of Masen.

ONEE, a player of very strong legitimacy in the renewable energy sector, which gives legitimacy to the governance of the cluster, with regard to the various stakeholders, notably externally, and is also a member of the scientific committee. involvement of public institutions at the start of the cluster, and always present to contribute to the growing development of the solar cluster and also to contribute to the legitimacy of the latter.

B) The establishment of constitutive rules
The solar cluster has set up rules for the selection of actors, this selection which is made by the solar cluster team composed of 4 people, a general manager, a business development manager, a green entrepreneurship manager and a support manager.

The selection of members is sectoral. The role and status of each member of the cluster is well defined for both permanent and non-permanent members. But for the certification and labeling of innovative projects it is the Moroccan agency for energy efficiency "AMEE" which accomplishes this mission, AMEE is one of the members of the scientific committee of the "solar cluster" which has set up standards for quality on the Moroccan market by strengthening the capacity of equipment and installers. and this has materialized in the development of the quality label for installers, Le Cluster Solaire, in partnership with Amisole, BsW and AMEE, is developing a process for the labeling of photovoltaic installers, in order to ensure the quality of the installations carried out on the Moroccan market.

also the establishment of an Industrial Center for solar testing on the Moroccan solar equipment market (CTI-Solaire) The Solar Cluster, in partnership with CERIMME, sets up a CTI whose mission is to test and control solar equipment, namely: solar water heaters, PV panels and ancillary equipment. Over 3 years, this CTI is intended to be the first testing and control platform in Morocco intended for industrialists in the solar sector. Governance in the "solar cluster" is characterized by a very formal and structuring approach to the framework of relations between actors within the cluster. The selection of members is sectoral and very open and stimulating towards SMEs and SMIs. The role of each member is well defined through various documents which provide information on internal regulations and procedure for setting up the ecosystem. Labeling of the Cluster by the CCG as a support structure for innovative start-ups in the renewable energy and green technologies sector. Labeling of the Cluster by the Ministry of Industry as part of its industrial development acceleration

program - Support of 2 million Dhs per year. Solar Cluster, Morocco focal point, of the renowned Climate Technology Center & Network (CTCN) of united nations for skills building and networking in green technology. Solar cluster, home to the center for climate innovation, a network of the World Bank to support the transition to clean energies and the adoption of climate-smart solutions.

C) The regulation methods

It is the capacity of the actors of the governance of the cluster to define the rules and the conditions of the conduct of a system, also to define the rewards and the sanctions which guarantees the respect of the rules, the aim of which is to create a process and a institutional environment conducive to innovation. The Solar Cluster is based on institutional and operational governance. The Board of Directors is made up of 16 members including the president and vice-president elected by the General Assembly. the operational team of the "solar cluster" is made up of 4 people, a general manager, a business development manager, a green entrepreneurship manager and a support manager. these operational bodies are supported by permanent thematic working groups for the establishment of action plans according to their scope of intervention. And for strategic governance is owned by the board of directors composed of president and vice-president and federations such as, FENELEC, is the National Federation of Electricity, Electronics and Renewable Energies was born from the merger between two major associations of the private electricity sector (ASMELEC and AMIEE) during the constitutive general assembly of November 26, 1997, to which some sixty companies among the most representative of the profession were invited. And the FIMME is (the Federation of Mechanical and Electromechanical Metallurgical Industries) created in 1951, works for the promotion and development of IMMEs, serves its members, defends their interests, contributes in the constructive evolution of regulations and promotes the sector in its comprehensiveness. the intervention of the members of the operational governance, specifically the entrepreneurship entity, is more in the initiation and support of green entrepreneurship at the level of the green business incubator and support for innovation often in an individualized way, that in the control of the sanctions. We can speak of a governance of the cluster shared between the president and the vice-president elected by the general assembly, and between the national federation FENELEC, FIMME member of the board of directors, for the taking of all strategic and economic decisions, and strategic orientations concerning the life of companies in the cluster and operational management. No disciplinary mechanism for control, sanction or conflict resolution is in place.

3) The normative dimension of institutional work:

The normative dimension of the work of institutional creation consists in forging a common language, which brings into play the informal dimensions of interactions, such as trust, and solidarity, which allows the different members of the cluster to collaborate more easily on innovative projects. The normative dimension develops the feeling of belonging to an organization that the cluster represents and thus contributes to an interactive dynamic of innovation, governance can, through institutional practices of a normative nature, legitimize the cluster as a structure of interaction and as an organizational form. This dimension of institutional work of a normative nature is based on two criteria:

- Identity construction of the cluster.
- The construction of a normative network.

A) Identity construction of the cluster:

Consists of formulating an explicit and coherent cluster strategy, and carrying out communication operations or round of this strategy internally and externally. The identity building of the cluster also consists in creating a common space for sharing, creation of professional associations, and collective participation in trade fairs.

The "solar cluster" has gradually built an image and an identity around the development of a competitive renewable energy industrial sector in Morocco, by networking the various players in the sector. This image is built around skills development within companies in the sector, industrial capacity building, and support for innovation in the renewable energy sector. the challenge is to maximize the use of synergies and pooling of stakeholders' resources for successful collaborative projects, creates communities between stakeholders in the sector through collaborative projects and supports them in realizing existing opportunities and integrating markets of renewables The governance of the "solar cluster" has worked a lot on the development of a community of people which is embodied by the association of solar cluster actors, administered by a board of directors composed of 16 seats, President Mr. Mustapha Bakkoury, and vice-president, Mr. Ahmed Skalli the latter elected by the general assembly. the permanent administrators composed of, Masen, FENELEC, FIMME. and for the elected administrators, are in total 10 seats, 9 for the category A1, and 2 seats for the A2 category. This community of people is reinforced by the existence of many physical spaces of sharing, it is the seat in the building Zenith 1, Sidi Maârouf 4th floor Casablanca on a Surface 278m2 and it also occupies the 1st floor with a surface of 200 m2. Beyond the community of people, there is a college of large companies that share common professional values, and interactions around innovation, also startups benefiting from support systems for business creation in within the new renewable energies incubator. Indeed, this positive image constitutes an identity for the “solar cluster”. Communication on the solar cluster to its internal stakeholders takes place through periodic meetings, externally through the organization of conferences, and participation in fairs and exhibitions. for the dissemination of the identity of the solar cluster around renewable energies, communication media are used such as (the website, directory, newsletters, magazines and newspapers) and especially driven by the creation of the new label.

B) The construction of a normative network:

The construction of a normative network comes to complete the process of legitimizing the cluster, by the establishment of a network based on new collaborative practices and also on the sharing of relationships of trust the sharing of standards and also of the values that give the legitimacy of the cluster qualifying as a structure of interaction. To build this normative network, the governance of the cluster must

demonstrate standards and values that justify a more cooperative attitude and that promote innovation. The construction of a normative network goes through the formalization of exchanges, that is to say the use of formal and informal mechanisms of exchanges between actors. The development of collaborative projects by creating joint working groups, and launching calls for tenders. It is also the integration of the scientific community by putting companies in touch with research laboratories. During our analysis of the identity construction of the solar cluster, we observed the presence of a community of businesses that would facilitate the construction of a network and the development of collaborative relationships on innovation projects. Members of the "solar cluster" governance have a number of practices in place to regulate and promote exchanges between companies, develop collaborative projects to achieve synergies, and bring the academic world closer to the professional. The exchange mechanisms are formal in nature within the "solar cluster" aimed at regulating interactions and, however, facilitating the establishment of new modes of collaboration between member companies. The board of directors sometimes intervenes on assistance with collaboration contracts and monitoring at the signing level and also offers legal training to help young entrepreneurs to carry out their projects under legal conditions that guarantee their rights and also their obligations. There are also meetings between members and MaitreBoukhris to discuss the various issues encountered when submitting to renewable energy projects. The number of collaborative projects developed to support industrial innovation has reached 52 projects since the creation of the "solar cluster" in 2014, starting with two projects in 2014, 7 projects in 2015, 11 projects in 2016, 14 projects in 2017, and 18 projects in 2018. Something that marks the collaborative aspect desired and encouraged by the “solar cluster”. Among these collaborative projects we can mention:

ESMO TERMO project
Pilot project to install a solar waste treatment and electricity production platform, in partnership with:

♣ Budget: 3,000 K MAD
♣ Project presented during COP 22

MULTICERAM project:
Pilot industrial project for the installation of a small PV power plant and an industrial heat production facility. In partnership with:

Objective: Develop the market for solar applications in industry

HELIOMAROC project:
launch of the first industrial prototyping project: HelioMarocIn partnership with:

- Objective: Capacity and skills development of Moroccan companies for the development of a Made in Morocco heliostat
- Funding: Up to 5 Million Dhs / project (to be confirmed)

AFTER project:
Development of a solution for monitoring underground water resources as part of the Green Smart Region program In entrepreneurship with :

PILOT CSP INDUSTRIAL project:
Capacity building project and installation of pilot projects in the small-scale industrial CSP In partnership with :

AUTOCONSOM pilot project:
Self-consumption hybrid pilot project with off-grid line -18 MW

In partnership with:

The “solar cluster” business incubator occupies a special position in the construction of a normative network for startups that their number in the “solar cluster” reaches 36 startups to host in 2018. It is organized around a eco system which offers a whole series of devices aiming to support the innovative project leader and to insert it into a network, including individual and collective support, Incubation program, Prototyping, Capacity building, Economic intelligence and intelligence , networking with local funders and laboratories. The passage through the incubator allows the creation of a language and a common thought for the project leaders, which also facilitates collaboration for innovation. The scientific community is present in the "solar cluster" through research laboratories, and universities such as "UNIVERSITE INTERNATIONALE DE RABAT" (UIR), represented by Mr. Noureddine MOUADDIB and "L'UNIVERSITE CADI AYYAD" , Represented by Mr. Hassan Hbid. The attachment of the scientific community is twofold, there is university research and laboratory research in the case of studying there is "Moroccan foundation for Advanced science innovation and researche" which is essentially based on these collaborations for the development of the scientific community of the “solar cluster”. The incubator and incubation quickly fostered the development of new companies resulting from this research-industry synergy.

1.4 The normative dimension of institutional work:

The normative dimension of institutional work consists of facilitating the identification and acquisition of knowledge for the companies in the cluster, in order to positively influence innovation. In this vision, the governance of the cluster has a real role to play in the management of

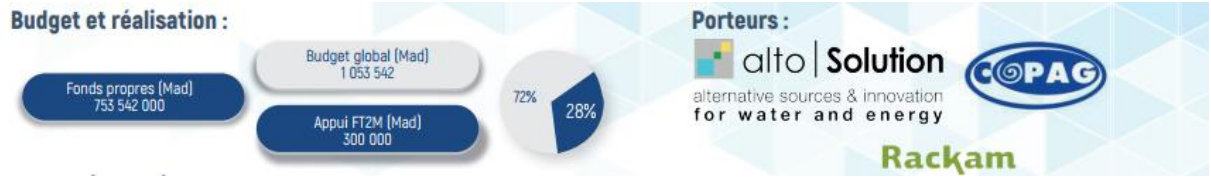
individual and collective knowledge. In this normative dimension three practices are distinguished:

- **Mimicry practices**
- **Knowledge management practices**
- **Developing the absorption capacities of cluster companies**

a) Mimicry practices: This is the way in which the actors of the governance of clusters will be able to facilitate the adoption of new practices, and especially that which promotes collaborative innovation, by associating old and new practices in order to make them more understandable and more accessible to cluster members. The governance of the "solar cluster" communicates sufficiently on the collaborative innovation projects at work within the cluster, from its website, and the specialized press, in order to materialize the results in terms of collaboration for innovation in the eyes. members of the cluster. And among these projects we will mention:

Energy calls for tenders Cluster Solaire consolidates and disseminates to its members calls for tenders from semi-public and private public actors in the field of Renewable Energies. Project development Solar thermal installation (CSH) serving the dairy industry In Morocco, large CSP (concentrated solar power) plants using parabolic trough technology (parabolic cylindrical concentrators) exist. These plants generate electricity to supply the national electricity grid. However, another major application exists for this technology: producing process heat for industrial use as a substitute for conventionally used fossil fuels (heavy fuel oil No. 2 and natural gas). We then speak of CST: Concentrated Solar Thermal. The objective of this project is to demonstrate the effectiveness of concentrated thermo-solar technologies, in particular using parabolic troughs, in an industrial environment as a partial replacement for fossil fuels.

Thus, the industrial demonstrator set up, with a thermal power of 50 kW, supplies heat to the industrial process of COPAG (agricultural cooperative of Taroudant). This heat is used by COPAG to heat the cleaning-in-place (CIP) solutions of its dairy: heating a strong acid solution, a strong stock solution and hot water. This is the first concentrated thermo-solar power plant in an industrial environment to provide process heat in Morocco.



Outlook and impacts: Achievement of an annual saving of 873 10 m3 in natural gas Development of a CSP technology in the industry made in Morocco by the start-up Alto Solutions Solar Village in Off Grid The project consists of the electrification of a village comprising (10 to 15 families) by photovoltaic solar energy, as well as the use of LED lighting and solar pumping. The main goal of this project is to create an autonomous isolated village while acting on its social development and this by facilitating access to school for children, especially young girls, and by creating new job opportunities for them. villager. Completion of this project will strengthen access to electricity through the establishment of a solar power plant and a minigrid that will meet the needs of the village.

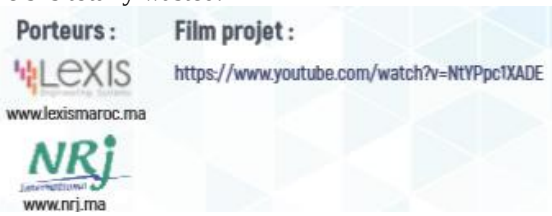
B) From a technical point of view, this project will use a set of solar energy-based solutions at a single point:

- Electrification thanks to a photovoltaic station with storage on batteries and mini-grid network.
- Use of solar for pumping water.
- Use of solar thermal for the production of hot water.

C) From a social point of view, the project contributes to the local development of the village thanks to the capacity building of the people designated for the management of the mini-plant, members of the village association. Indeed, training sessions on solar, solar pumping and solar thermal were organized on site by the company Cleanergy. Access to electricity and water also helps to improve the quality of life and develop agriculture in the village.

Outlook and impacts: Project model developed and installed again in the Essaouira region Scalling-up for access to electricity for a village in Essaouira and creation of several jobs for women thanks to an argan tree workshop installed on site and powered from the new solar power plant BeVar: Inverter / frequency converter with dual energy source The aim of the BeVar project is to develop an innovative inverter which, in a situation of low sunshine, makes it possible to recover energy from solar panels and to add it to the electrical energy coming from the grid or from the generator. Thus, the consumption of energy from the public network or from the generator set is reduced as much as possible, thus allowing significant savings and the reduction of greenhouse gas emissions. The maximum power of the BeVar inverter will be 45kW, which corresponds to the majority of the demands of the target market, namely solar pumping in Morocco. These inverters must make the best use of the energy supplied by the solar panels to power the

pump motors, but it cannot be used when the level of sunlight is insufficient: at the beginning and end of the day, cloudy periods. The inverters currently on the market then use energy from the public grid, when it isavailable, or energy from a generator therefore the energy from solar panels is totally wasted.



Outlook and impacts: Several innovations have been incorporated into this drive, in particular the LORA means of communication which provides connectivity. The product was installed at a first major client (OCP) in May 2018. Creation of 5 permanent direct jobs and 5 temporary direct jobs during the assembly phases. Creation of an average of 10 indirect jobs. Export sales with the objective of recruiting an international salesperson, especially for other African countries. SMO Thermo: Solar pyrolysis of waste The new SMO® process, using only solar energy, is the first to treat waste, including plastics, and biomass, i.e. heterogeneous and wet carbon compounds, by converting them into fuels, electricity and plastics; this, without greenhouse gas emissions and in an energy autonomous manner. Its positive energy balance, mobility, adaptability and versatility in terms of inputs (waste / biomass) and outputs (raw materials and energy) mean that it has no known direct competition to date. All the processes implemented are patented and proprietary.

The "SMO®" process developed by PEPS and NST offers an industrial, efficient and profitable solution to two central issues of sustainable development, namely: -treatment of waste in an ecological way with sedentarization in the area of value creation (the value added is created locally), - economically profitable alternative to fossil fuels; in addition, the operation and development of our process at the scale of a territory will have a positive impact on societal issues such as employment, training, agricultural development, or more generally, the image of a territory. With the support of FT2M, This "SMO_Thermo®" project consists in completing the SMO® furnace with a mixed thermodynamic turbine cycle Steam / ORC2 making it possible to transform the thermal energy into electricity, with an efficiency of at least 30%. produced by the solar / chemical cycle of the complete SMO® process. The SMO_Thermo® cycle can be used and adapted to other thermodynamic solar processes.

Outlook and impacts: Installation of the first SMO Thermo platform in the Marrakech region. Creation of more than 10 direct and indirect jobs - Filing of patents for the turbine part. Development of a low cost atmospheric pressure thermosiphon solar water heater "made in Morocco". The project consists of manufacturing and marketing an innovative solar water heater operating at atmospheric pressure and at low cost. The project is led by Kauser Eco and the International University of Rabat. Kauser Eco contributes its know-how in solar water heaters and the UIR brings its expertise and its intellectual property portfolio. In addition, the project leaders call on ERGON Energy Solutions, a Spanish company specializing in the development of solutions based on renewable energies in order to provide its expertise and ensure the transfer of technology for the design, development and certification of 'a proof of concept prototype. The solar water heater uses vacuum tubes in order to reduce thermal losses. Its innovative feature is the use of a tubular heat exchanger placed at the top of the tank. It brings the advantage of lowering the cost price and improving the reliability of the product. This project aims to strengthen the solar industrial sector, by manufacturing and marketing solar water heaters "made in Morocco" and to deepen the technological knowledge of Morocco in the field of solar water heaters, and this through the transmission of knowledge of 'a Spanish industrialist towards a Moroccan industrialist and the support of the university. This innovative mode of operation aims to help the Moroccan industrialist Kauser Eco to acquire a new low-cost technology with high added value. A second stage will be devoted to the certification of the product and then to the establishment of a manufacturing workshop dedicated to the technology in question. The manufacture of innovative 100% Moroccan solar water heaters will be jointly launched by Kauser Eco and UIR. It will allow the technology developed to be transferred to the Moroccan market and then internationally.

Ro Perspectives and impacts:
In 2017, industrialization and marketing of solar water heaters started by Kauser Eco bot EcoBright: Robot for cleaning photovoltaic panels The cleaning of solar modules is a decisive maneuver in photovoltaic installations. Deposits of dirt or dust on solar panels often cause a reduction in the current and voltage generated by the photovoltaic field, thus reducing the efficiency of the solar

installation (up to 35% of energy losses). To overcome this problem, and taking into account the state of the art which provides solutions with fairly limited characteristics, the project consists in setting up a cleaning device by dedusting the photovoltaic solar panels. This device, named Eco-Bright, works by mechanical and aeraulic dust drive, and is powered by a well-designed photovoltaic system, and managed automatically by remote control. Eco-Bright moves safely transversely and longitudinally over a whole row of photovoltaic panels and is made up of two mechanical and aeraulic systems combined with an electrical and electronic part.

Outlook and impacts:

- The robot is in the testing phase
- A marketing plan has been developed for the sale of the robot nationally and in Africa
- Creation of several indirect jobs through the design and assembly of the robot Aquasolaris Analytic: solution for the remote supervision and management of photovoltaic installations

The objective of the Aquasolaris Analytics project is to provide innovative tools for the supervision and control environment of the industrial activities of any company installing or using a large number of renewable energy equipment, and at the same time to strongly promote its monitoring and maintenance of industrial installations (Facilities Management). Concretely, this involves developing a software platform (a portal) for industrial supervision, **structured around a core composed of:** A Human-Machine interface for navigation and Real-time actions of the Web / Mobile type, a solution layout comprising: a data processing solution (parser), an ETL solution (Exctract Transform and Load), a visualization interface for production, performance and real-time Web / Mobile alerts, as well as a tool allowing the management of the curative or other intervention via Web / Mobile. This arrangement produces computer-assisted maintenance management (CMMS) that is easy to master, graphical and usable on PC or Mobile, integrating real-time data for monitoring and optimized control of renewables, from an intelligence base, archiving the history processes and recipes for making the system safe (Installations from 2 to several hundred kWp). The intrinsic added value of the project lies in the analysis in real time to allow, the provision of information, the coordination, the cooperation, and the anticipation of problems for the management of the life cycle and the safety of the plants. photovoltaics at a more competitive price than current market solutions allow. Implementation of a Smart Farming / Digital Farming platform The project consists of setting up a 100% Moroccan smart farming platform. This platform will consist of:

- Different sensors (air temperature, soil temperature, humidity, water tank level, caliber, radiation in the greenhouse, ...)
- IOT communication technology based on one of the most popular technologies (LoRa, Sigfox, ..)
- An integrated management system, allowing "Monitoring" in real time, and allowing to have daily reports, with alerts by email or SMS, and actions to be carried out to optimize production
- Automatic irrigation or action activation controls (opening, closing, etc.) This project will improve farmers' production by making it possible to anticipate problems and shortages (fertilizer, watering, energy, pests, etc.). This project will also make it possible to rationalize the consumption of energy and water. The goal is to offer a 100% Moroccan platform at a very affordable price. The existing platforms on the market are foreign and are not accessible to small and medium farmers. The final objective is therefore to provide access to new technologies for this type of farmer and to rationalize water consumption.

Outlook and impacts:

- Project under development
- Service offered will contribute to the development of AgriTech in Morocco Development of a fleet of LED luminaires the project consists of setting up a 100% Moroccan smart farming platform.

This platform will consist of:

- Different sensors (air temperature, soil temperature, humidity, water tank level, caliber, radiation in the greenhouse, ...)
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Outlook and impacts:

- Project under development
- Service offered will contribute to the development of AgriTech in Morocco The collaborative behavior of companies, however, facilitates the scope of actions to link governance and, consequently, when companies testify or communicate with each other on the help provided by governance in establishing contact with an

innovation partner and the benefits derived from a collaborative innovation approach, this further encourages mimicry practices in favor of knowledge transfer between co-located companies. Research laboratories on the "solar cluster" are also focused on promoting their research, which further increases the dissemination of collaborative practices and, hence, the transfer of knowledge to companies.

b) Knowledge management practices:

According to KBVC's approach, which considers knowledge management as the source of new knowledge creation is the source of innovation and clustering (Arikan, 2009). The role of management here is to identify knowledge, acquire it and use it to innovate. external The identification of knowledge is done by fixing the communication around integrating symbolic concepts for the actors of the cluster, The supply of information processes (technical or generic) Opening the cluster to external sources of knowledge Knowledge is acquired by setting up and managing structuring projects through governance. Launch of calls for collective projects by governance. And the use of knowledge is done through the formalization of knowledge, Developments of shared platforms, and Support for its dispersal the identification of knowledge in the solar cluster is done by setting up an interactive database referencing more than 300 Moroccan companies operating in different sectors, on the basis of a mapping work of the industrial sector carried out within the framework of of the Solar Cluster. And the objectives to be achieved are improving the competitiveness of the Moroccan supply, creating synergies between industry players, and building industrial capacities. The acquisition and use of knowledge in the solar cluster the acquisition of knowledge is done by launching calls for projects and collaborative projects, and we have seen that this has been concretized by exchanges and partnerships with Spanish industrialists. And to facilitate the use of knowledge, a B TO B platform has been developed offering functionalities, allowing exchanges, and developing synergies and realizing Business opportunities. Main features offered to users in the platform:

- Access to a directory of companies by sector
- Possibility of adding companies to its network
- Access to a discussion area
- Access to the list of collaborative projects
- Access to company data sheets
- Consulting the news of the members of the Cluster

c) Developing the absorption capacities of cluster:

Companies To develop the absorption capacity of companies there are certain practices that develop this capacity, and these are mainly training or apprenticeship actions. Here companies make a financial commitment to training programs, group or individual. This is therefore a voluntary attitude on the part of companies which cannot be appropriate for knowledge externalities. These training and learning actions are reflected either by the establishment of specialized training or by the acquisition of technical or commercial skills. The solar cluster has a special position insofar as it hosts training centers on its site in addition to its relations with the INTERNATIONAL University of Rabat and the CADI AYYAD University of Marrakech. More than 30 training / coaching sessions provided within the "solar cluster" for the loan of 600 beneficiaries, among these trainings we can mention;

- Training on renewable electricity purchase contracts (PPA).
- Training "Energy management system certification: Prerequisites and process according to ISO 50001 vs 2018".
- Training on solar thermal "Domestic hot water".
- Practical training on the sizing of photovoltaic installations using the PVSYST software.

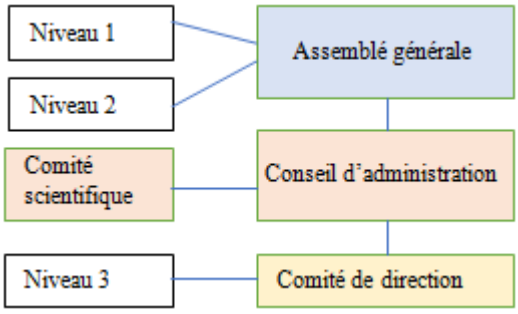
Workshop on compliance with the Cmim marking

- Design & Engineering Review.
- Training program "Learning to be Green".
- Technical training in RE and EE.
- Training for solar pump installers and maintainers.
- Training Energy efficiency and integration of renewable energies in industry.
- Training on "Design Thinking". To develop the absorption capacity of companies and startups, the cluster has successfully organized targeted and comprehensive training programs.

1.3 The form and practices of governance in the "solar cluster"

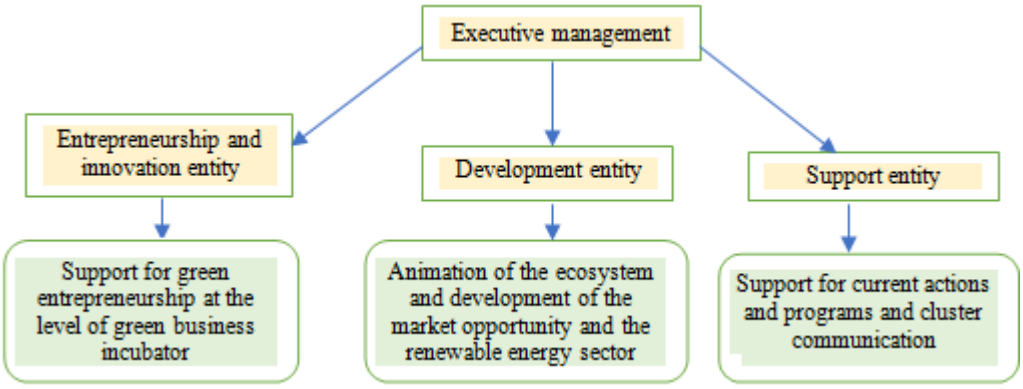
In the "solar cluster" we see a strong involvement of founding members, private and public, in governance bodies, strategic and operational, and their mastery of the operating rules of the pole, we can then qualify governance in the solar cluster by mixed governance predominantly interventionist or hierarchical. The participation of the three business, research center and institutional players is balanced within the cluster. We will present the mode of governance used by the "solar cluster", and also we will detail its strategic and operational governance structure.

The three levels of governance in the "solar cluster" can be represented as follows:



The Solar Cluster is based on institutional governance represented by public institutions such as ONEE, AMEE, SIE, and operational by a board of directors made up of 16 members whose president and vice-president are elected by the General Assembly, as follows: BOARD OF DIRECTORS : PRESIDENT: M. MUSTAPHA BAKKOURY VICE-PRESIDENT: Mr. AHMED SQUALLI HOUSSINI PERMANENT DIRECTORS: MASEN, FENELEC, FIMME Strategic governance of the "solar cluster": Strategic governance is ensured by the scientific committee which intervenes on the R&D part of the cluster. He is in charge of the selection and labeling of

collaborative projects, in charge of the daily functioning of the cluster to establish relationships of trust, and limit the risks of opportunism. The scientific committee is made up of researchers and industrialists in the field of renewable energies. a technology roadmap is established over a period of four years. Launched in 2014, the Solar Cluster is today a key player in the renewable energy ecosystem in Morocco, the objective being for the Cluster to contribute to the development and structuring of a national competitive sector. The scientific committee is then composed of: THE SCIENTIFIC COMMITTEE: ONEE, represented by Mr. Adberrahim El Hafidi AMEE, represented by Mr. Said Mouline SIE, represented by Mr. Ahmed Baroudi MASCIR, represented by Madame Nawal Chraibi MEDZ, represented by Mr. ChakirBouatia CERIMME, represented by Mr. Abdeslam Halouani Operational governance of the "solar cluster": The solar cluster team is made up of 4 people, a general manager, a business development manager, a green entrepreneurship manager and a support manager. The operational bodies are supported by permanent thematic working groups for the establishment of action plans according to their scope of intervention.



Representation of the general organization of the source solar cluster "the solar cluster"

2. Conclusion

After our analysis of the "solar cluster" we can say that the latter opts for several and different institutional practices that promote the emergence of innovation in the renewable energy sector. And that the collaboration of the three actors, companies, research centers, and institutions is balanced within the cluster in favor of the development of several innovative projects. something that lets us say after all the innovation parameters that the "solar cluster" perfectly matches innovative clusters through the provision of incubators, support for innovative projects, the development of technical knowledge through the training offer, and collaboration with universities and research centers. The solar cluster is the example of a Moroccan cluster which is on the path to innovation with safe pats.

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