Annual Report* of IGCP Project No. 643, Water resources in Wet tropics of West-Central Africa (3WCA)

*NOTE: MAXIMUM LENGTH OF THE TEXT REPORT IS 5 (FIVE) PAGES (starting from question 1). SINGLE SPACE, 12 POINT FONT. REPORTS EXCEEDING THIS LENGTH WILL BE RETURNED TO THE AUTHOR(S) WITH THE REQUEST OF REDUCING THE TEXT TO THE ABOVE STANDARD.

A LIST OF PUBLICATIONS HAS TO BE ADDED AS AN ANNEX.

*REMEMBER: IF THIS IS THE FINAL YEAR OF YOUR PROJECT, PLEASE SUBMIT A REVIEW ARTICLE ABOUT YOUR PROJECT TO THE IUGS JOURNAL ‘EPISODES’.

The scientific information in this report will further be used for publication on the IGCP website hosted at UNESCO (please feel free to attach any additional information you may consider relevant to the assessment of your project).

IGCP project short title: Water resources in Wet tropics and West-Central Africa (3WCA)
Duration: 5 years
Please tick this box if the report is for a Project on extended term (OET): ☒

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Date of submission of report: 01 / 12 / 2016
Signature of project leader(s):
Guidelines for Annual Report

Please use the following headlines to report the present status and scientific achievements of your project (write N/A where not applicable) and explain abbreviations you use in your report.

1. Website address(es) related to the project
   www.picass-eau.ird.fr
   www.benin.ird.fr

2. Summary of major past achievements of the project
   The 3WCA project is in its second edition. But it is related to the "Aghien Lagoon" research project which takes place under the LMI PICASS'EAU. That LMI associates different laboratories from West-Central Africa and France. These laboratories study hydro(geo)logical variability in relation with climate and land-cover changes. They have built a strong background in international collaboration in particular:
   - Support for exchange students;
   - Support for the mobility of teachers;
   - The financing of laboratory materials;
   - Support for setting new research project.

   Aquifer characterization by new geophysical tools workshop has taken place in Benin, from November, 17 to 26, 2016.

3. Achievements of the project this year only

3.1. General scientific achievements
   (Meetings are not considered as scientific achievements, they should be listed under heading 3.3.)
   **Aquifer characterization by new geophysical tools**
   - Hydrogeophysical workshop in the basement rocks area in the north of Benin using gravimetric and pumping test methods.
   - Hydrogeophysical workshop in the sedimentary coastal area in the south of Benin using TDEM, Conductivity and topographic methods.

3.2. List of IGCP project meetings/symposia and IGCP related meetings/symposia with exact attendance (if possible) and number of countries
   N/A

3.3. Educational, training or capacity building activities related to the IGCP project and IGCP project participants.
   Hydrogeophysical workshop in Benin, from November 17 to 26, 2016, see list of participants in the file "participants list"

3.4. List of countries involved in the project (please *indicate the countries active this year and make the distinction between:
   - Benin
   - Ivory Coast
   - France
   - Niger
3.5. Participation of scientists from developing countries, and in particular young and women scientists: exact number and please describe how this project specifically benefited women scientists, young scientists and/or scientists from developing countries

<table>
<thead>
<tr>
<th></th>
<th>Total number of scientists</th>
<th>Number of male scientists</th>
<th>Number of female scientists</th>
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<tr>
<td>Number of participating scientists</td>
<td>20</td>
<td>11</td>
<td>9</td>
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<td>Number of young scientists/students (&lt;35 years old)</td>
<td>17</td>
<td>9</td>
<td>8</td>
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<tr>
<td>Number of scientists from developing countries</td>
<td>18</td>
<td>10</td>
<td>8</td>
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</table>

3.6. List of the 5 most important publications (including maps) of this year

a) could not have been published were if not for this project

b) related to this project
An article will be written

Full bibliography of this year (listed by author in alphabetical order with the most recent work listed first) has to be submitted as an annex. Distinguish between peer review literature and other (no abstracts).

a) could not have been published were if not for this project N/A
b) related to this project N/A
3.7. Activities involving other IGCP projects, UNESCO, IUGS or others

The coordination of the 3WCA project (IGCP project) is provided by KAMAGATE Bamory (University of Nangui Abrogoua, Ivory Coast) who is also the West and Central Africa General Coordinator of the FRIEND-WCA since April 2011 (http://armspark.msem.univ-montp2.fr/friendaoc/ukpresentation.htm).

FRIEND (Flow Regimes from International Experimental and Network Data) is the project I.I of the fifth International Hydrological Programme of UNESCO (IHP). It aims to develop a better understanding of the differences and similarities between different hydrological regions through mutual exchange of data, knowledge and calculation methods. 19 countries of West and Central Africa are involved and are the FRIEND AOC network. This FRIEND-WCA network of researchers formed the basis of partners during the construction of the 3WCA project (Ivory Coast, Benin, Cameroon and Niger).

Moreover, during the last International Conference (Hammamet, Tunisia 20 to 30 October 2015) on Hydrology of Great River Basin of Africa organized by the FRIENDWATER program (Transversal program of the International Hydrological Programme (IHP) UNESCO), several participants of the 3WCA project have made oral and posters presentations (KAMAGATE Bamory, KOUAME Auguste Kouassi Lazare Côte d'Ivoire, Jean Emmanuel PATUREL France, Emmanuel LAWIN of Benin). This conference aimed to better sharing of knowledge and data, increasing the number of large river basins observatories, international cooperation and improving cooperation between development agencies, national and international operators and the research sector. Similarly a regional workshop on the revision of hydrological standards in West and Central Africa will be organized by the FRIEND-WCA in April 2016 in Abidjan (Ivory Coast). This meeting will focus on the experts and scientists of the West African subregion, policymakers of ECOWAS and UNESCO through IHP.

ECOWAS: Economic Community of West African States

3.8. Scientific Legacy: Is there a need for storage of publications, field data, and other results of the project? Do you have a clear vision concerning where the data would be stored and who will be the custodian?

3WCA project is a training project. So, there is no particular need to storage data. However, it is linked to the www.benin.ird.fr whose data will be stored at the IRD library who is the custodian and the www.uac.bj whose data will be stored at the University of Abomey-calavi who is the custodian. However, let's remember that Hydrogeological data (piezometric level fluctuation) collected during several years are stored at the library of Benin Office of Water.

3.9. What tangible improvements has your project obtained? (Besides publications, we are interested to hear about improvements to research, scientific contacts, policy implications, etc)

- During two weeks, 3WCA Project put together various specialties from different countries (hydrology, hydrogeology hydrogeophysic and geologists) of Africa and France,
- The courses were delivered by trainers with a binomial form, two from France (North) and the other from South country (Benin), this is a way to make a real contact and perennity in the North-South collaboration,
- Students from different South countries worked together during two weeks and this has created a real relationship between young researchers, (a WhatsApp group has been created),
Our knowledge of field geology and hydrogeological and hydrogeophysical skills are now improved,

The operational structures such as the Beninian Office of Water, National Office of Drinking Water of Côte d'Ivoire and the Institute of Research and development of France took part in this field school, this represents a better way to transfer skills.

The relationship between universities of the North (University of Strasbourg, University of Grenoble) and university of the south (University of Abomey-Calavi, WASCAL doctorate School) has been established.

3.10. What kinds of activities in respect to the benefit of society and science outreach has your project undertaken?
It is the involvement of operational structures in the activities of the training workshop.

3.11. What kind of public information (media reports, etc) has your project generated? And how do you evaluate their impact?

The story of the training workshop is available on the IRD portal: [http://www.benin.ird.fr](http://www.benin.ird.fr)

4. Activities planned

4.1. General goals
The main objective of this project is to carry out thematic workshops focusing on groundwater resources in different geological contexts.

4.2. Tentative list of specific meetings and field trips (please list the participating countries)

- 2015, Côte d'Ivoire: Training Workshop “Hydrological and hydrogeological modeling in sub-humid Africa”
- 2016, Benin: Training Workshop “Aquifer characterization by new geophysical tools”
- 2017, Cameroun: Training Workshop “Remote sensing as support for hydrological modeling in sub-humid Africa”
- 2017, Benin: Training Workshop “Evapotranspiration measurement and vegetation functioning”
- 2018, Côte d'Ivoire: Training Workshop “Synthesis Workshop and prospective”

5. Project funding requested
The annual demand to IGCP is $10000 per year ($50000 during the 5 years). Each year the remaining $3,685 will be supported by the LMI PICASS'EAU.
This year, we requested $10,000 but we received $8,000. Next year the workshop is scheduled to be held in Cameroun where the training will take place. This will require much more money. That is why we request $10,000 for next year.

6. Request for extension, on-extended-term-status, or intention to propose successor project
Specifically, during four years, we'll make one thematic workshop per year focused on key elements of the hydrological cycle in order to improve the capacity of partners involved in the project (Benin, Côte d'Ivoire and Cameroon). The main aim of these workshops is to enhance the knowledge of participants to better contribute to sustainable water access and support for agriculture, natural resource conservation, food security and human health. A review workshop will be conducted at the fifth year.
in order to establish the synthesis of workshops, the evaluation of the project and its impact on the target laboratories and consider prospective.

7. Financial statement ($ USD only)

The IGCP Scientific Board would like to be informed how the IGCP funds were used.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Amount ($)</th>
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<tbody>
<tr>
<td>Transportation (Long distance)</td>
<td>3259 USD</td>
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<tr>
<td>Accommodation</td>
<td>5300 USD</td>
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<tr>
<td>Local Transport (ie. bus, minivans)</td>
<td>3500 USD</td>
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<td>Organizing Expenses</td>
<td>700 USD</td>
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<td>TOTAL</td>
<td>12759 USD</td>
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<td>UNESCO GRAND Total of Above</td>
<td>8000 USD</td>
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<tr>
<td>LMI and JEAI Contribution</td>
<td>4759 USD</td>
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8. What additional funding besides the IGCP seed funding has your project obtained thanks to the IGCP label? Please estimate the budget received for meetings, research or other and identify the source.

**LMI PICASS’EAU contribution:** LMI PICASS’EAU's contribution is valued at $3,559. It concerns the long-distance transport, accommodation and trainer fees.

**JEAI contribution:** contribution is valued at $1,200. It concerns the accommodation and local transport.

9. Attach any information you may consider relevant

Hydrogeophysical training workshop is the first of its kind to University of Abomey-Calavi. It has been a great success. Now, we ensure that all publications that come out of the acquired field data that supports the 3WCA workshop training will mention UNESCO as a financial partner.
10. Annex 1: Workshop Summary

IGCP PROJET: 3WCA
Aquifer characterization by new geophysical tools

A training workshop on hydrogeophysical skills have taken place from November 17 to 26, 2016 at the University of Abomey-Calavi in Cotonou (UAC, Benin). This workshop is a part of the “Water resources in Wet tropics of West Central Africa (3WCA)” project supported by the International Geoscience Programme (IGPC) of UNESCO, the International Joint Laboratory PICASS’EAU (Predicting Impact of Climate and uses of water resources). The workshop trained for 10 days of practical and theoretical courses, Masters Student candidates and young researchers and practitioners. It has been opening to eight beninian students, one member of the Ivorian operational structure tree students of Ivory Coast and two students of Niger. The training is designed to improve competence of learners in the field of hydrogeophysical characterization required for a better knowledge of groundwater resources, vital for people in developing countries. The workshop deals with two contrasted geological context: basement rocks aquifers and sedimentary aquifers.

At the north of Benin, the geological environment is characterize by basement rocks and fractures aquifers. The study area is located on the quite well instrumented AMMA-Catch observatory.
At the south of Benin, the geological environment is characterize by sedimentary basin and sedimentary aquifers with granular porosity. The study area is located between the Atlantic Ocean and the lagoons.
This initiative will continue next year in Cameroon, where there will be a workshop on “Remote sensing as support for hydrological modeling in sub-humid Africa” in the 3WCA project.
Annex 2: List of participants

PROJET IGCP-UNESCO
ATELIER DE FORMATION ET ECOLES DE TERRAIN EN HYDROGEOPHYSIQUE
Université d'Abomey-Calavi (UAC), Institut National de l'Eau (INE) BENIN
Période du 17 au 26 novembre 2016

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