Evaluation of the Research and Professional Activity of the Institutes of the Czech Academy of Sciences (CAS) for the period 2010–2014

Final Report on the Evaluation of the Institute

Name of the Institute: Global Change Research Centre of the CAS, v. v. i.

Fields, in which the Institute registered its teams:

Earth and related environmental sciences

Observer representing the Academy Council of the CAS: Josef Lazar
Observer representing the Institute: Zdeněk Žalud, substitute observer Karel Klem, Vladimír Špunda

Commission No. 5: Earth and related environmental sciences
Chair: Prof. Dr. Franz Fiedler

Date(s) of the visit of the Institute: November 2, 2015
Programme of the visit of the Institute: see attached Minutes from the visit

Evaluated research teams:
No. 1 - Division of climate analysis and modelling; No. 2 - Division of ecosystem analysis

A. Evaluation of the Institute as a whole

Report on the Global Change Research Centre (GCRC) of the CAS (CzechGlobe)

Foreword

The GCRC, a member of the network of research institutions of the CAS in the Czech Republic, occupies an impressive new building in Brno, containing both offices and laboratories. It also has an experimental field site in the mountains where there is an instrumented 250m tall tower, plus a network of five old (but being modernized) and two new ecosystem stations, and a small aircraft used for remote sensing studies. The CGRC's purpose is to investigate the very important interactions between the atmosphere, biosphere and geosphere in the "Anthropocene era", a time of global change due both to the burning of fossil fuels and to major changes of land use, which cause increasing concentrations of carbon dioxide (an important greenhouse gas) in the atmosphere. The total number of CzechGlobe staff is 235. Funding comes mainly from European sources, from national projects and from the Czech Academy of Sciences.

1. General impression of the Institute (Main research activities): this is very good and, in some areas, excellent on an international scale. Detailed evaluations are briefly given here.

    a) The quality of the results obtained by the Institute staff is most impressive. The quality of the publications is generally high.
    b) Student involvement in the Institute is strong because of the links with several university groups, which must be regarded as collaborators and not competitors. The teams should seek to recruit more doctoral candidates from abroad.
    c) The impact and the relevance of the studies conducted at the GCRC to the Czech society today are exceptionally high. The Institute's contacts with members of Government and with the business sector (e.g., electricity generators), together with the wide range of popularization activities, are especially impressive.
    d) In the national context, the Institute's teams are significant leaders. In the international context, they are effective players.
    e) Concerning the Institute's vitality and sustainability, these are excellent. New funding sources should nonetheless be explored.
    f) In terms of strategy and plans for the future, these are excellent on the international scale. Following a phase of exceptional growth, there is now a need for consolidation, in particular with respect to research directions, staff numbers and financial resources. Such consolidation should take place before further expansion (e.g., setting up new stations in Ghana, Panama and Vietnam) is planned. The excellent infrastructure of the GCRC established in recent years is an immense asset. However, there is a risk that this could become a major burden to the CAS if the GCRC is not wisely integrated into, and supported through, strong national and international research programmes. A clear risk management strategy must be put in place at the GCRC.

2. Structure of the Institute

    The organizational structure follows the norm for state funded research institutes in the Czech Republic. The organizational units are termed scientific domains, of which there are five: climatology and atmosphere research, ecosystem analysis, impact studies and plant ecophysiology, human dimensions of climate change, and adaptive

and innovative techniques. For the evaluation procedure, the work of part of the GCRC was presented by two Research Teams: the Climate and Analysis Team, presented by Miroslav Tranka, and the Ecosystem Analysis Team, presented by Alice Dvorska. Both presentations were impressive and very informative.

3. Role of the Board

   The role of the GCRC steering committee is to issue calls for research proposals, to approve new agreements and project proposals, and to ensure that the teams keep their focus on global change issues (i.e. not become diverted). Proposals to hire new staff are put forward by the Institute teams; the Board members vote on the ideas presented to them. This system appears to work well. The Director told us that there are fifteen teams in the Institute; this Panel heard from only two of these.

4. Role of the Director

   The Director, Michal Marek, is supported by a secretariat, an international scientific advisory board having ten members which meets annually to determine the strategy to be followed by the Institute teams, and an internal supervisory board (see 3), of which he is one of six members, but not the chair. He has a Scientific deputy director, who is responsible for the library, marketing activities and doctoral students, etc., and an Executive director who is responsible for the administration, project preparation and management, and all forms of technical support. In the GCRC, the Director is a strong personality (though not a dictator) who appears to direct the studies which are carried out in the Institute more closely than do the Directors of some other Institutes; this can be a good characteristic in the Panel's opinion if, at the same time, other staff participate strongly in the decision making processes. However, the Director said to us that the team leaders "have freedom".

5. Recommendations
   a) A significant weakness of the present position is that the Institute relies on a considerable amount of external funding which has been obtained competitively. The situation would be improved if
      (i) the Czech Academy of Sciences could increase its allocation to the GCRC, and
      (ii) the Institute actively sought sources of external funding (e.g., within Europe).
   b) The GCRC is invited to consider whether it would be desirable, and also practical, for the Geography Department in Brno to work within the GCRC organisation. This is because that Department is not very well integrated into the Institute of Geonics in Ostrava, to which it is presently affiliated. That Department needs strong new leadership, in the Panel's opinion; such leadership is present within the GCRC.
   c) The teams should be encouraged to collaborate more with other Institutes of the CAS.
   d) The teams should be encouraged to input their data into numerical models which are available in other European countries, and to evaluate the outputs of such models.
   e) The teams are encouraged to work even more with European and North American colleagues, and to have more co-authors on their papers from abroad; the teams should aim for publications in more top-rank journals with high Impact Factors.

B. Evaluation of the individual teams

Evaluation of the Team No. 1: Division of climate analysis and modelling

Report on the Research Team of Division of Climate Analysis and Modelling, Global Change Research Centre of the CAS (CzechGlobe)

1. **Introduction**. This interdisciplinary team was created just at the beginning of the re-evaluation period. It concentrates its activities on a very broad front of climate (ranging from past, contemporary and future) issues and their effects on agriculture (e.g., on wheat crops) and on ecosystems. Beside the organisation of the required experimental infrastructure, some considerable effort has been put into creating different types of material (e.g., on climate change awareness) which are of great interest to the public. The focus of the research is on droughts, particularly their influence and impact on agricultural crops and forestry in the Czech Republic. The Research Plan includes regional modelling of climate in the next period. The basis for that direction will be the ALADIN numerical prediction model as a starting point.

2. **Strengths and Opportunities**. The team is now well equipped with the necessary tools of models and instruments. Highly motivated scientists start to analyze climate variability with some hydro-meteorological phenomena, including extreme events. Opportunities exist for soil studies and for further collaborations with the Czech Hydrometeorological Institute, the Institute of Atmospheric Physics and the Institute of Chemical Process Fundamentals. Good links to international groups should be strengthened and will be followed by interpreting computer outcomes from a variety of models. The climate change impacts will be studied especially with respect to the Czech territory; thus this work is very relevant to Czech society today.

3. **Weaknesses and Threats**. Because the range of problems dealing with global and regional climate and connected to influences on agriculture, forestry, and socio-economic effects is so broad, the starting of all this work could be too ambitious. This ambition may be a result of the need for gaining research funds from a variety of sources, including by seeking projects with energy providers. This may lead to a splitting of the research group into too many topics and losing the expertise on a few important sectors in competition to other international groups. It is apparent that activities which further develop more modern results on improvements of parameterization processes inside the global and regional models of the atmosphere and biosphere are missing.

4. **Recommendations**. The team has gained, in the relatively short time of its existence, a very visible record of publications in the field of recent past climates, and their impacts on agriculture and on other related topics like the distribution of pest species and bird behavior. This shows the existence of the broad range of expertise in the research team. A stronger activity will be needed in using global and regional scale models. A strong link with existing climate research groups outside of the country must be formed to perform at an international level of knowledge; more international co-authors of papers should be sought.

5. **Detailed evaluations**.
   a) The publications submitted for evaluation have gained a high record in international journals. 19 papers were submitted for the evaluation. All were rated better than the category 4; 5 of them were ranked in category 3, the majority reached category 2 and another was in category 1. The team is to be congratulated on having a paper published in Nature Climate Change. Most of the publications have been completed in joint research areas with neighboring universities and with some colleagues outside of the country. In order to keep the record high, exchange visits by scientists from abroad must be further supported by grants.
   b) Many of the leading scientists have good links to universities and deliver classes to their educational programs; they also act as a supervisor for Master's degree and Ph.D. students. The team encourages students to participate in its programs, which is very worthy.
   c) The team uses its resources in ways which demonstrate their societal relevance. Several educational initiatives are being taken. The team's studies are clearly very relevant to Czech society today and in the future.
   d) To attract researchers from abroad is of fundamental importance. This objective should be continued and should form a standard exchange of knowledge between the team members and colleagues abroad.
   e) The age structure is of promising character in this team. Most of the members are below 40, and only a few are of the age of 45 and beyond. It seems to be that in the presence of some experienced scientists in this category this is a good strategy for a growing community.
   f) The strategy of the research in the coming years is in a good frame in the part of climate analysis, especially with respect to agricultural ecosystems and adaptation to climate change. The strategy concerning model development and model applications is not so well explained. Model installations and also the availability of computer resources will need additional and very experienced team members.

Evaluation of the Team No. 2: Division of ecosystem analysis

Report on the Division of Ecosystem Analysis, Global Change Research Centre of the CAS

1. **Introduction**. The Global Change Research Centre of CAS (GCRC) has experienced a very rapid growth since its re-creation in 2010, primarily through CzechGlobe, a large project funded by the EU (in total 35 Mill. Euro). Major resources have been invested into large-scale and unique infrastructures, which are considered to be strong assets of the Centre (and the Division) to make a variety of observations in relation to increasing amounts of greenhouse gases in the atmosphere. Indeed, the whole Centre has been framed around this large project, which has been an immense opportunity for the Centre; at the same time it forms a major challenge in respect to the Centre's long-term sustainability and consolidation. Full scientific operation of CzechGlobe started in 2014.
   The Division of Ecosystem Analysis is a relatively large unit within the Centre, with 17.12 FTE researchers (in 2014). Its size more than doubled between 2010 and 2014, albeit the relative increase being lower than that for the Centre as a whole. The Division has invested major resources into a network of eddy-covariance instrumented towers to quantify carbon-fluxes (as part of the pan-European Integrated Carbon Observation System, ICOS), but also in instrumenting long-term research sites to quantify hydrological and biogeochemical processes (network of ecosystem stations covering the main ecosystem types).
   The research outputs (both basic and applied) are considered high in respect to the numbers of publications (115 publications in journals with impact factor during the reporting period 2010-2014). However, most of the papers assessed during Phase I of the evaluation are considered internationally visible, but not yet excellent enough (note: only 9 out of 27 papers are rated as excellent, i.e. in categories 1 and 2).

2. **Strengths and Opportunities**. The unique research infrastructure not only allows key questions in global change research to be answered, but also serves as a nucleus for national and international collaborations. The research – summarized under "The changing environment in the changing world" – implies very high societal relevance.

3. **Weaknesses and Threats**. The GCRC and its divisions have grown rapidly during recent years and are now entering a phase of consolidation. The low rate of solid base funding requires the implementation of bold risk-avoidance strategies and alternative development scenarios. At the same time there seems to be substantial overlaps – or opportunities for collaboration – with other well-established research institutions in the Czech Republic (and internationally), such as with the Biology Centre and various universities. Up to now, the identity of the Division is strongly based on the impressive infrastructure, and on subsequent collaborations, rather than on bold research questions. Therefore, more emphasis must be paid to the key research questions that will be answered, benefiting from the unique infrastructure and broad range of expertise available. However, it is self-evident that a research centre on global change will never be all-inclusive.

4. **Recommendations.** The Division, as well as the GCRC as a whole, must establish a clear strategy for consolidation and long-term sustainability. Alternative options and scenarios for development need to be established. Furthermore, a clear benchmarking strategy is required in order to avoid too much overlap with the research portfolios of other very good research institutes, both nationally and internationally. The Division must develop a clear strategy for where it intends to become an internationally visible and eventually world-leading research organization, and where it will put the major efforts of all its activities. Hence, the Division must make significant efforts to increase the quality of the research rather than just their quantity.

5. **Detailed evaluations**.
   a) The Division has (as stated in their report) a very broad and multidisciplinary research portfolio, from modelling biodiversity research (although it is not clear what this means) to monitoring aerosol properties related to climate change. A unifying research vision/mission for the entire Division needs to be developed in order to establish a unique research position, nationally and internationally. It is evident that global change research is a very complex issue; therefore a careful integration of the various disciplines, within the Division and the Centre as well as with national and international partners, is required.
   b) As stated in the research plan for 2015-2019, the Division plans to carry out stimulating research, including investigating biogeochemical processes at different hierarchical/organizational levels of the environment, including at forest sites, and drought impacts on carbon fluxes, or advancing methods and technologies for quantifying matter fluxes and understanding the underlying mechanisms of coupled hydro-bio-geo-chemical processes.
   However, a better integration of the biodiversity research into the global change research is required. The upscaling from leaf and plant to regional and even global level is a critical but most difficult endeavour requiring mutual international collaboration with scientists at the most experienced institutes in Europe and America.
   c) The Division has established promising collaborations with various research organizations and networks internationally, including with developing countries. However, a stronger emphasis should be placed on collaboration with the globally leading institutions in this field of research (e.g., PIK, ETH, OCCR in Berne, and others in North America). The Division's ambition to recommend ecosystem management procedures which enhance resilience to climate change is most worthwhile.
   d) A clear quality development and management strategy must be put in place. The establishment of a scientific advisory board (SAB) for the Centre (and therefore for the Division) is considered a very good step forward; however, the SAB must serve as a critical advisor to the Centre and the Division, rather than primarily as a promotor of the Centre.
   e) Because of close links to the university, 8 doctoral candidates successfully defended their theses during the reporting period. Considerable efforts should continue to be put by the Division into recruiting and training the best students.
   f) The age structure of the team is considered balanced (the majority of members being between 25 and 45 years old) and promising for the sustainability of the

Division; however, there seems to be an under-representation of experienced researchers, which may impede the elaboration of bold research questions and visions (see above).

g) A general remark: it is not clear how decisions in the Centre are taken, and to what extent a consultative and participatory approach is in place.

Date: December 28, 2015

Commission Chair: Prof. Dr. Franz Fiedler