

Applying Norwegian Earth System Model for Climate Change Scenario Development, Monsoon and Climate Extreme Events Studies in Vietnam

End review

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APPLYING NORWEGIAN EARTH SYSTEM MODEL FOR CLIMATE CHANGE SCENARIO DEVELOPMENT, MONSOON AND CLIMATE EXTREME EVENTS STUDIES IN VIETNAM

End review

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Conclusion

The main goal of this project; which was capacity building in the field of climate change at the two partnering institutions; is achieved. This is especially the case at IMHEN, for those staffmembers who participated directly or indirectly in the implementation of the project. The expected scientific outcomes have been achieved, and the outcomes will contribute to plans for adaptation and mitigation of climate change in Vietnam. Funds have been managed satisfactorily. Funds could probably have been used more cost-efficiently, but that might have had a negative effect on the quality of the scientific outcomes. Collaboration between the two partners has met expectations on Vietnamese side, but not fully on Norwegian side. The reason seems to have been unclarified ambitions. Collaboration between Vietnam and Norway in this field in the future should build on experiences from this project. The Norwegian embassy in Hanoi has communicated that there will be no further available funding from their side to continue this project.

Executive summary

The agreement was signed in November 2011 as a collaborative project between IMHEN in Vietnam and BCCR in Norway. The main goal was to increase capacity in the field of climate system modelling at the two institutions. Objectives were development of climate models, climate change scenarios and assessment of monsoon patterns and extreme climate events. The project period was originally two years, 2012-2013, but was given a no-cost extension throughout 2014.

The end review took place in September and October 2016 and is based on written documentation, interviews and consultants' assessment. List of documents and interviews can be found in annexes.

Effectiveness was assessed according to outcomes of capacity building, scientific deliverables and cooperation between the partners. Capacity building has been conducted through collaboration between the two partners, and through workshops arranged in Vietnam. Capacity has been enhanced, but the level is difficult to measure, as the project lacks baseline and agreed indicators. The scientific outcomes have been delivered as expected and will be used in climate adaptation and mitigation in Vietnam. Promotion of enhanced collaboration between Norway and Vietnam is not achieved.

On the Vietnamese side, funds have been used on equipment and consultancies, whereas on the Norwegian side, they have been used for salaries to three researchers. Cost-efficiency could possibly have been better, if use of costly consultancies on the Vietnamese side had been avoided and if work had been conducted differently in Norway. However, as this is also a question of quality, the assessment is not conclusive.

The two institutions are strong and experienced in managing international collaborative scientific projects. Discrepancies in budget set-up between the proposal and the reporting have challenged assessment of the use of funds. However, according to the auditor and the donor, funds have been managed satisfactorily. Anticorruption measures have been handled according to Vietnamese regulations and there is no suspicion of corruption. According to IMHEN, gender has been crosscutting. The final report states that the Project Management Board has had 33 % women, and 20-27% women were participating in workshops.

Partnership between IMHEN and BCCR has been asymmetrical, as IMHEN is satisfied whereas BCCR is not satisfied with communication with IMHEN. This is seemingly not discussed during the project phase, and could possibly have been dealt with if risk assessment had been addressed in a different manner. Insufficient communication might have affected willingness for enhanced collaboration, but has probably not effected the scientific outcomes of the project.

The project has been relevant to Vietnamese policies on climate change and to Norwegian policy on scientific collaboration in the same field. It has not had operations on the ground, but has delivered results that will benefit the people of Vietnam long term. It links to several other programmes administered by IMHEN and others, focusing on development in Vietnam.

Background

In November 2011, the Norwegian Embassy in Hanoi signed an agreement with the Vietnam Institute of Meteorology, Hydrology and Environment (IMHEN) with the title *“Applying Norwegian earth system model for climate change scenario development, monsoon and climate extreme events studies in Vietnam”*. The main goal of the project was to enhance capacity at both IMHEN and their Norwegian partner, Bjerknes Centre for Climate Research (BCCR), in the field of climate system modelling, focusing on developing climate change scenarios by simulating future changes of extreme climate events.

The project was justified on the basis of the future scenarios for the effects of climate change in the Asian region as they are expressed in the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) from 2007, and further, on the assessments of the Vietnam Ministry of Natural Resources and Environment (MONRE) from 2009. MONRE estimated in the Climate Change and Sea Level Rise Scenarios for Vietnam from 2009 that the annual average temperature had increased by between 0.5 and 0.7°C and the sea level has risen by about 20 cm over the past 50 years. With these past changes in climate, developing and updating climate change scenarios was considered one of the most important tasks in the Vietnam National Target Program to Respond to Climate Change (NTP, 2008).

A wide use of Global Climate Models (GCM)s and development of Regional Climate Models (RCM) is essential for the development of CC scenarios in Vietnam. Small-scale climate change scenarios are required to get relevant spatial detailed information. Spatial high resolutions can make scenarios to describe small-scale climatic characteristics. Temporal high resolutions can extract and assess the extremes of climate variables in more detail. Monsoon is a dominant phenomenon in South East Asia’s and in particular in Vietnam’s climate. Thus, future changes in the monsoon system caused by climate change need to be considered.

The IPCC scenarios of AR4 were based on 23 GCMs. The high number of models aimed to imply as many uncertainties as possible in climate change scenarios, thus resulting in an increase in the confidence level of climate change impact assessments. BCCR has developed the Norwegian Earth System Model (NorESM), which is one of five European GCMs used by IPCC in AR4. The next development step of BCCR modelling research will also be used in IPCC’s next assessment report - AR5.

IMHEN has been assigned to develop and update climate change scenarios for Vietnam. In order to take advantage of one another strength and capability in the climate change field, IMHEN and BCCR signed a Memorandum of Understanding (MoU) on Co-operation in December 2009. The project proposal is based on general provisions agreed by both parties in the MoU.

In 2011, the Royal Norwegian Embassy in Hanoi received a joint proposal from IMHEN and BCCR on applying the Norwegian earth system model for climate scenarios in Vietnam. The rationale for the project was to develop climate change scenarios with a high level of confidence and with spatial and

temporally high resolution. This will enable prediction of socio-economic development trends and uncertainties of future climate simulations.

The objectives of the project were set to be:

- Enhancing capacity of implementing and applying for IMHEN in modelling global climate system by accessing, training and using the models developed in BCCR and others;
- Developing high resolution climate change scenarios for the 2011 - 2015 period and after; and
- Assessing future changes of extreme climate events and monsoon system based on climate simulations and scenarios

The main expected outcomes of the project were:

- To enhance capacity for IMHEN's staff in climate modelling and climate change scenarios with technical support from BCCR, using BCCR's NorESM and other models which are used in IPCC's AR5;
- To increase knowledge of climate change impacts on Vietnam and Southeast Asia;
- To improve understanding of the monsoon system and other changes of climate systems, focusing on present and future rainfall, in particular calibrating and validating the simulations of NorESM in Southeast Asia; and
- To promote co-operation between Vietnam and Norway.

The project was granted ODA funds of USD 794,000, equivalent to NOK 4,453,000. In addition, it was granted with a corresponding fund of USD 133,000 from the Vietnamese government. The time frame was originally two years, 2012 and 2013, but it was later prolonged with a no-cost extension of one additional year, throughout 2014.

It was anticipated that IMHEN's capacity would be enhanced by implementing the project including the simulation of future climate, studies of extreme future climate variables and events and assess future changes of monsoon systems. Also, BCCR expected to gain from the project since NorESM needs to be evaluated with other climate conditions different from polar climate. This purpose is also expressed in ongoing BCCR's collaborative projects in China, India and Bangladesh.

According to the agreement, an end review of the project was to be conducted. A review was included in the Embassy's Work Plan 2016 and Norad was requested to assist with technical services. In June 2016, it was decided that Norad would conduct the review, supported by a Vietnamese consultant appointed by the Embassy. Terms of reference can be found in Annex I.

Methodology:

The End Review is based on review of written documents and interviews with partners and stakeholders of the project. List of documents and interviewees can be found in Annex II.

A list of guiding questions was set up prior to the interviews. The questions made the basis for the interviews. Some stakeholders preferred to answer only in writing and did not meet us face to face. A survey was also sent out to participants in the workshops conducted by IMHEN during the project phase. List of questions can be found in Annex III.

Since the project's result framework lacked baseline and agreed indicators, assessment of achievements is based on the interviewees' statements and the consultants' opinions.

Findings

TOR: Provide factual (quantitative and qualitative) information on the efficiency (the relationship of input to output) and effectiveness (the relationship of output to outcome/impact) of the Project at the termination of Project;

Effectiveness

Effectiveness is assessed in relation to the goals, objectives and expected outcomes of the project.

Capacity building

The main goal and one of four objectives are capacity building at IMHEN and BCCR in the field of modelling future scenarios. Increased capacity means increased ability of individuals or institutions to perform more work with higher quality. As scientific work is learning in itself, we can anticipate that capacity has increased among those individuals who have participated in the project. To what extent is difficult to measure exactly. Whether institutional capacity has increased depends on how many of the employees have been involved, whether they stay in the institution, how they have worked together with other scientists and which role they hold in the institution.

Apart from scientific work and collaboration, the capacity building activities in the project include exchange of scientific personnel between Vietnam and Norway, and launch of technical and dissemination workshops in Vietnam.

Quote from IMHEN's answer in the questionnaire:

This capacity is one of the objectives of the project and enhanced through the training, workshops and the knowledge exchange with BCCR's experts. The future climate projections were used as one of inputs for developing climate change scenarios of Vietnam by IMHEN.

Five scientists from IMHEN visited BCCR in Bergen, Norway for one week, where they participated in

lectures and received other inputs. The persons who visited Bergen were:

- Prof. Dr. Nguyen Van Thang (Project deputy director)
- Dr. Ngo Tien Giang (Project principle researcher)
- Mr. Truong Ba Kien (models and projections group leader)
- Mr. Do Thanh Tung (monsoon group leader)
- Mr. Nguyen Anh Tuan (extreme group leader)

Those who participated said they had gained new knowledge and that they had disseminated the knowledge to colleagues when they returned to Vietnam.

Quote from IMHEN's answer on the questionnaire:

NorESM and cWRF models were used in the project and the IMHEN's staffs were trained to use them in global climate simulation and developing regional climate downscaling for climate change scenarios. The staffs who trained in Norway then appointed to be research team leaders so they can shared the knowledge and experiences to others. In general, there were about 10-15 staffs enhanced the capacity in climate and climate modelling at different levels.

As part of the capacity building activities, IMHEN also conducted six workshops; one kick of workshop, two technical workshops, two dissemination workshops and one closing workshop. There were approximately 60-70 participants in each workshop. The main audiences were scientific people from IMHEN or other scientific institutions, but there were also participants from relevant ministries: MONRE, Ministry of Agriculture and Rural Development, Ministry of Foreign Affairs, Ministry of Planning and Investment of Vietnam, etc. Outcome of the workshops are not reported, but it is reason to believe that IMHEN researchers gained competence from participating in the workshops.

BCCR says that the aim of capacity building perhaps was a misinterpretation of the project description. They look more upon themselves as sub-contractors in the project. However, the consultants anticipate that BCCR has gained new knowledge and experience through running their model with data from Vietnam, and this has probably increased capacity of the researchers who have worked on the project to some extent.

Increased knowledge

The last two objectives were to develop high resolution climate change scenarios for the 2011 - 2015 period and after; and to assess future changes of extreme climate events and monsoon system. Expected outcomes were increased knowledge of climate change impacts and improved understanding of monsoon system and other changes of climate systems in the region.

Data from the NorESM model is provided from BCCR to IMHEN. The NorESM is one of five different models that IMHEN has used to develop climate scenarios for Vietnam. Use of several models gains the climate scenario development with more robustness. The Norwegian project has delivered data as anticipated, and is included at IMHEN as part of a bigger project. The report, with the working title

“Climate Change and Sea Level Rise Scenarios for Vietnam, 2016”, was presented at the conference “IPCC achievements and Vietnam actions in climate change” in Hanoi on 24 October 2016 with acknowledgement of Norwegian Earth Model. The report was sent to the Government of Vietnam for approval in October 2016. Thus, it was not available for the consultants to browse at the time of the field visit. The scenarios will be used for planning and development in different sectors.

In addition, IMHEN has published four scientific proceedings from the work they have done. Three out of four publications are in Vietnamese, and they are listed in Annex V. There has been no co-publication between IMHEN and BCCR, and BCCR has not worked out scientific publications under this project.

Promotion of cooperation between Vietnam and Norway

The promotion of cooperation between Vietnam and Norway is listed as the last expected outcome of this project. We cannot find any measure to achieve this as a sustainable outcome. Cooperation has been going on during the project phase, but there is, at time of the end review, no plans for continued cooperation after the end of the project. BCCR says possible future cooperation should learn from experiences in the project, in particular on general communication, clear expectations on both sides, realistic plans, and mutual understanding. The Norwegian embassy in Hanoi has communicated that there will be no available funding from their side to continue this project.

Consultants’ assessments on effectiveness: The main goal of capacity development is probably achieved to some extent, especially at IMHEN. The level of capacity increase is not possible to measure, since there is no baseline and no agreed indicators. The expected scientific objectives and outcomes are achieved as planned, particularly when the project is assessed as one of several contributions to the climate scenario report. Increased cooperation between Vietnam and Norway in the future in this field is not secured at the time of the end review. However, partnerships and personal relationships created might induce new collaboration when opportunities arise

Efficiency

ODA funds from Norway was USD 794 000 equivalent to NOK 4 453 000 at the time of submission of the proposal. According to the proposal, the funds were planned to be distributed between the different activities as follows:

- Computing and data storage systems: USD 70,700
- Research and model application -Norwegian experts and Vietnamese scientists: USD 442,400
- Workshops and Trainings: USD 124,900
- Travel, reporting and other expenses: USD 46,000
- Administration & management: USD 60,000
- Auditing: USD 10,000
- Contingencies: USD40,000

IMHEN has, according to oral information, used funds for two major tasks: equipment and consultancies. The computer purchased has been used in the project. At the time of the end review,

it had been replaced with stronger computers to run the complex models. IMHEN is listing a total of 21 consultancy reports (Annex V, in Vietnamese only). The reason for using consultants has been that there is strong expertise in the relevant areas in institutions outside the institute, and it benefitted the analysis to use this expertise. According to IMHEN, this has been collaborative work where IMHEN has carried out the studies/analysis while consultants conducted reviews and gave feedback and comments for further improvement.

It has not been possible for the consultants to find more information about how the funds were actually utilized. The financial reports and the audit reports categorize expenses in budget lines linked to activities but not to actual expenditures like equipment, consultancies etc. This is in line with the agreement annex.

In 2012, IMHEN followed a procurement plan submitted to the Embassy, covering both consultancies and equipment, as part of an approved work plan and budget for 2012. In the 2012 report, the external auditor pointed at payments for consultants exceeding EU cost norms from 34 % to 56 %. The former procurement plan did not include references to EU-UN cost norms. However, this was improved later, based on 2012 auditor's recommendations. According to the agreement (clause 37), any contract entered into the project should be sent to the embassy for information. This is, according to the embassy, not done by IMHEN regarding the consultancy contracts.

Regarding BCCR, they have been transferred NOK 2 307 300 (about 52% based on the rates at submission of the proposal), according to financial statements. NOK 2 210 794 (approx. 96 %) is used for 3575 working hours (about 2 full years) for BCCR researchers. The working hours are distributed among three researchers. The rest, about 4 % have been used on minor equipment, meetings and one travel for one researcher (Dr. Martin Peter King) to Vietnam.

Uni Research/BCCR processed and provided data necessary to drive WRF to IMHEN for their WRF model experiments. They provided two technical reports to IMHEN, for the work done in 2012 and 2013, respectively. Uni Research also completed its own sets of downscaling experiments for East Asia. The resulting data was made available to IMHEN as well as the climate research community at large for further analyses. BCCR also conducted a workshop with lectures and hosting Vietnamese researchers for the purpose of interaction for one week.

On the question about efficiency, IMHEN answers that they regard funds were used in the most effective way for the project objectives. BCCR says that funds probably could have been used more efficient at the institute if fewer researchers were engaged and if the number of different tasks and work packages had been reduced. Some work components were started but not completed.

Consultants' assessments on efficiency: Based on all the available information, it is difficult for the consultants to assess how efficient the funds have been used. A number of capacity building activities have been carried out, and have probably increased capacity both among individuals and at IMHEN. One can anticipate that IMHEN would have gained more capacity by doing the analysis themselves and not engage consultants. But this is claimed to have been collaborative work, and in that sense, the consultancies may have strengthened capacity at IMHEN. The scientific work might have been more cost efficient if carried out by IMHEN instead of consultants, and if BCCR had

implemented it differently. However, this is also a matter of quality. Some money could probably have been saved in keeping consultancy fees to previously mentioned levels.

Partners' practices and strengths and weaknesses

TOR: Provide information on partners' practices and strengths and weaknesses with respect to its potential for influence and dialogues with partners, including:

- ✓ *Initiation and planning systems;*
- ✓ *Capacity-building in partner organizations;*
- ✓ *Role and approach of partners;*
- ✓ *Anti-corruption measures;*
- ✓ *Gender policies;*
- ✓ *Financial planning/follow-up.*

Initiation and planning systems

IMHEN, organized under MONRE, has 257 employees, and a high number of them with scientific qualifications. The main office is in Hanoi, and they have in addition four experimental stations located around the country. Their major activities and achievements are presented in four groups: Meteorology, Climatology and Agro-meteorology; Hydrology, Water Resources, Marine Hydrology; Environment and Climate Change.

The institute has contributed to several central official reports regarding climate change in Vietnam, among those the *Vietnam Special Report on Managing the Risks of Extreme Events and Disaster to Advance Climate Change Adaptation (VN-SREX 2012-2014)*, the *National Climate Change Strategy (2011)* and the *National Action Plan to Respond to Climate Change (2012)* were issued. They are collaborating with, and receiving support from, a number of international organizations and are working bilaterally with a number of countries. They are also engaged in education, and have since 1982 graduated 46 PhD candidates. Currently, additional 47 PhD students are affiliated to the institute.

IMHEN, as a skilled and professional institute, with many international partners, has the capability to plan and implement this type of project. The fact that the scientific outcomes achieved at a satisfactorily financial management, underlines this.

Capacity building in partner institutions

As said above, scientific work in its nature will enhance capacity among those individuals who are engaged. IMHEN has also included partners from other institutions in their workshops. In spite of sending out questionnaires and attempts to arrange meetings, the consultants did not get any feedback about to which degree capacity had increased among participants in these workshops. IMHEN explains that the project was technical in nature and the workshops were conducted quite a while earlier. Some participants attended workshops only once, and did not remember enough to be willing to answer the questionnaire.

Role and approach of partners

While the main goal of the project was to increase capacity at both institutions, BCCR claimed to look upon themselves as a subcontractor in this project and not a scientific partner. They ran the NorESM models for IMHEN, but they did not participate in scientific publishing or report writing. They said that scientific writing would demand much more working hours, and this was not covered by the project. Further, it was BCCR's opinion that communication and collaborative work between the partners did not take place as expected, and that this was probably due to asymmetrical expectations and lack of mutual understanding. IMHEN on their side are satisfied with the collaboration with BCCR, and believe they have got what they expected out of this project.

Anti-corruption measures

According to the annual reports, IMHEN has followed the purchasing procedures of Vietnamese regulations with cross checking and auditing. Annual meetings in 2012 and 2013 recorded discussions on anti-corruption measures. The audit reports do not indicate any suspicion of corruption.

Gender policy

IMHEN has no specific gender policy, but says this is always considered in all activities and projects. The Norwegian project has not had a specific focus on gender issues. According to minutes of the annual meetings, there has been reporting on an adequate ratio of men/women involved in the implementation of the project.

Financial planning and follow-up

The project has been audited by DeLoitte. The reports are good and there have been just a few findings through the years that have required follow up by IMHEN. The findings are linked to cases of using rates exceeding agreed norms (mentioned above), lack of separate account for counterpart fund, lack of declaration for value added tax refund and depreciation of tangible assets. These have been either followed up the next year or have been explained in a way that the Embassy has accepted.

Review of financial statements for this review has met challenges because the financial statements follow different budget lines in the proposal and in the statements. The financial statements follow the budget lines given in the agreement annex, and is therefore accepted by the Embassy. However, the financial statements report expenditures linked to activities, but they do not report exactly how the money is spent. This should be noted as a weakness in the reporting system. Minutes from the annual meeting in 2012 pointed at the need for a more detailed financial report, which was taken into the revised annual report for 2012.

The audit report for 2014 notifies that expenditures on technical conference slightly exceed the UN-EN Guidelines for financing local costs in development cooperation with Vietnam. The high costs are explained by IMHEN and accepted by the Embassy.

Consultants' assessment of partners' practices, strengths and weaknesses: IMHEN seems to be capable of running international projects, and they are capable of delivering results as demanded from both donors and from their government. The project would possibly have benefitted from better communications between the two partners. This is in particular the case if they had ambitions for scientific collaboration. However, there is an impression that such ambitions were not expressed in this project. The reporting has, according to the external auditor, been sufficient and acceptable. However, better coherence between budget of the proposal, narrow reports and financial reports would probably have given better insight of use of funds during the implementation phase. Capacity building towards stakeholders could probably have been more targeted, but this was no specific expected outcome of this project.

Sustainability

TOR: Assess the sustainability of the project, including value-added for Vietnamese implementing institutions.

Regarding capacity building, BCCR has delivered a service to IMHEN, and has probably gained some experiences that will be useful for the future, at least as long as the same individuals stay in their positions in the institution. The same is the case with IMHEN, but the fact that they bought some of the work from consultants is not sustainable in the same way. However, IMHEN's work with the scenario report gives them experiences and knowledge, and since many employees worked with the report, they have gained increased capacity as long as the individuals stay in their position.

Regarding scientific output, the project has contributed to the development of knowledge about climate change in Vietnam and the region, that will be included in the climate scenario report and will be sustained and used in several sectors of Vietnam when the report is released. According to MONRE, the report will be used for policies and planning in the environmental sector in Vietnam, including follow-up of the *Paris Agenda* for the years to come.

The report "Climate change and sea level rise scenarios for Vietnam" has explicitly acknowledged the Norwegian Earth model contribution to the scenario that has been submitted for Government's approval in October 2016.

Consultants' assessment of sustainability: Outcomes of increased capacity and new knowledge will be sustained and used in the years to come. The Norwegian project has added value first and foremost by its contribution to the robustness of the climate scenarios, but also by capacity development at IMHEN.

Risk management during planning and implementation

TOR: Assess partners' risk management during planning and implementation.

The project document identifies two risks: i) A lack of basis for receiving knowledge transfer through project and ii) Confusion of staff in the implementing agency with the regulations of sponsor.

On question to which extent these risks have been mitigated properly, IMHEN answers that they have. While there is no formal discussion about these identified risks at the annual meetings,

challenges have been communicated regularly and reported in the annual reports

BCCR says that they experienced a lack of understanding on their side about how IMHEN managed research projects and what their expectations could be. They found that the communication from them had little effect on activities carried out by IMHEN researchers. These weaknesses were not mitigated in the project.

It is unclear to which extent BCCR has raised the issues of unsatisfactory communication during the implementation phase. BCCR participated in one annual meeting, but the problem of communication was not raised in this meeting, according to the minutes.

No other unforeseen risks are reported, except for delays in implementation which were mitigated through a no-cost extension of the project.

Consultants' assessment of risk management: Challenges that have occurred during the project implementation have been discussed and sought mitigated at the annual meetings. The problem of unsatisfactory communication felt by BCCR has, however, not come to the table during the implementation. This in itself may confirm problems of communication and illustrates gaps in expectations between the two partners. Good communication should be seen as a responsibility for both partners, and problems should have been raised at the annual meetings. It is not clear to which extent these communication problems have affected outcomes of the project.

Relevance

TOR: Assess how relevant the execution of the project in was in relation to Vietnamese policies and strategies, as well as the bilateral priorities of Norwegian development cooperation with Vietnam.

The project is relevant to Vietnamese policies, as justified in the proposal. A wide use of different climate models, especially models selected by the IPCC to construct scenarios, is a top priority for developing climate change scenarios in Vietnam. Climate change and sea level rise scenarios are important scientific basis for assessing climate change impacts and for recommending adaptation options. Vietnam's NTP to 2015, therefore, includes the following tasks: i) a complete assessment of impacts of climate change, especially sea level rise, on sectors and localities; and ii) recommendations of measures to respond to climate change for sectors and localities.

According to MONRE, the report will enable Vietnam to develop plans under a changing climate for several sectors and localities. It will also help Vietnam in the work of implementing the *Paris agenda*.

The Norwegian Embassy in Hanoi has assessed the project to be relevant to the needs of Vietnam and the region of South East Asia, and in line with Vietnam's priorities in climate change and disaster risk reduction, with reference to National Target Programme to Response to Climate Change (NTP-RCC), National Strategy on Climate Change and the National Strategy for Disaster Prevention, Response and Mitigation to 2020. It is also aligned with the Norwegian policy to promote close cooperation between local research centers and Norwegian centers with relevant expertise in the

field of climate change and disaster management. Furthermore, Vietnam has been one of four priority countries in addition to China, Cuba and Bangladesh selected by Norway for cooperation with Norwegian Centers of Expertise on risk reduction and emergency response as indicated in the Report no. 9 (2007-2008) to the Storting “Norwegian Policy on Prevention of Humanitarian Crises”.

Consultants’ assessments of relevance: The project has been relevant for Vietnamese policies on climate change and to Norwegian policies on cooperation between scientific institutions in Norway and other countries in the field of climate change and disaster management.

Coordination with other relevant activities on the ground in Vietnam

TOR: Assess coordination with other relevant activities on the ground in Vietnam.

This project did not operate on the ground in Vietnam, but will contribute to lay the ground for policies that will benefit the people of Vietnam in the long run. However, IMHEN is, through their scientific work, linking the outcomes of this project to other ongoing projects set up to benefit the people of Vietnam.

According to the Norwegian Embassy in Hanoi, the ClimaViet project, which is an agriculture project that pilots both adaptation and mitigation measures to climate change in the rice cultivation in Vietnam, has been in dialogue with IMHEN to update data information in this regard. In addition, the project also links up with the projects ADPC and Meteorological Institute (MET) Norway in Vietnam; supported by the Norwegian MFA.

According to IMHEN and BCCR, the modelling with NorESM was used together with five other models to create the climate scenario report. The report “*Climate change and sea level rise scenarios for Vietnam*” 2016, which has been submitted for Government’s approval in October 2016, has been briefly presented at the conference “*IPCC achievements and Vietnam actions in climate change*” on 24 October 2016 in Hanoi. It has explicitly acknowledged the application of NorESM in the development of scenario for 2016. The four other scenarios are based on collaboration with Australia (the CSIRO-project <http://vnclimate.vn/en/about/csiro/>), Japan (the SP-RCC-project), UK and USA. Communication with Dr. Jack Katzfrey, leader of the Csiro-project, confirms that the Norwegian project is discussed with Csiro. He assumes that results are included in the scenarios, but cannot say to which extent.

The Support Program to Respond to Climate Change (SP-RCC) is an initiative taken by the Vietnamese Government and development partners (i.e. Japan International Cooperation Agency (JICA) and Agence Française de Développement (AFD)) to open the policy dialogue between governmental agencies and international development partners on all climate change issues in Vietnam. Since the establishment in 2009, SP-RCC has received the support from various development partners including JICA, AFD, Canadian International Development Agency (CIDA), World Bank (WB), Australian Department of Foreign Affairs and Trade (DFAT), and Export-Import Bank of Korea (K-Eximbank). Communication with MONRE confirms that IMHEN’s work with climate scenarios, including the Norwegian project, is linked to SP-RCC.

NGOs have not been involved in the climate scenario program of IMHEN. However, NGOs in Vietnam are heavily engaged in climate change issues, and eleven of them have formed the *Climate Change Working Group* (CCWG) headed by Oxfam in Hanoi. The group is, on one hand, promoting awareness raising about possible effects of climate change among people on the ground. The climate scenario report from IMHEN will be of value for this work. On the other hand, they are working towards the government in order to communicate the needs of all people in Vietnam, especially focusing on women and vulnerable groups in the society. The government plans that will be based on the climate scenario report will be of great concern to the work of CCWG.

Consultants' assessment of coordination with other activities on the ground in Vietnam: The project is not operating on the ground, but the outcomes can be part of an important platform for policies and plans that will affect people on the ground in long term. It is linked to projects in the field supported by other foreign donors, and it will be relevant for NGOs operating in the field of climate change.

Annex I Terms of Reference

End-review

of the Project “*Applying Norwegian Earth System Model for Climate Change Scenarios Development, Monsoon and Extreme Climate Event Study in Vietnam*” SRV-10/0018”

1. Background

The Project “*Applying Norwegian Earth System Model for Climate Change Scenarios Development, Monsoon and Extreme Climate Event Study in Vietnam*”- SRV-10/0018” (hereinafter referred to as the IMHEN-BCCR) was implemented from November 2011 to December 2014 by the Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN) in collaboration with the Norwegian Bjerknes Centre for Climate Research (BCCR) and other partners.

The goal of the Project was to enhance capacity for IMHEN in the field of climate system modelling, focusing on developing climate change scenarios, simulating future changes of extreme climate events and monsoon systems. These include: (i) implementing and applying global climate system modelling; (ii) development of high resolution climate change scenarios for Viet Nam; and (iii) assessment of future changes of extreme climate events and monsoon system.

The Project has been supported by the Norwegian Ministry of Foreign Affairs (MFA) with total of NOK 4 399 408 for 2011-2014.

Point 45, Article X of the Project Agreement signed on 25 November 2011 stated that an end-review focusing on progress to date and the effectiveness of the Project, i.e. the extent to which the Purpose has been achieved, should be conducted over and above the budget at the end of the support period. An assessment of the Project’s impact could also be included. The support period was in 2014 extended from 30 April till 31 December 2014. Repayment of unused funds to the Embassy is expected to be effectuated in June 2016.

In line with the Project Agreement, the Norwegian Embassy in Hanoi, in consultation with IMHEN, has been planning for an end-review of the Project in 2016. The team will consist of one international and one local (national) consultant.

2. Purpose, context and intended use

The overall purpose of this review is thus to assess the achievement of the goals of the Project, as well as efficiency and effectiveness, risks, the capacity of the grant recipient and the models and methods employed in the Project. It is important to assess sustainability, anti-corruption, gender and local capacity building as well as lessons learnt within these areas in the Project.

3. Scope of work

The specific objectives of the review are:

- To assess the achievements and performance of the Project in terms of outcomes (and if possible impacts), efficiency, effectiveness and relevance;
- To assess any discrepancies compared to the application in the institutional and professional capacity of the partners to manage and implement the Project;
- To assess the partners' planned use of the achieved results further

The review shall in particular:

- Provide factual (quantitative and qualitative) information on the efficiency (the relationship of input to output) and effectiveness (the relationship of output to outcome/impact) of the Project at the termination of Project;
- Provide information on partners' practices and strengths and weaknesses with respect to its potential for influence and dialogues with partners, including:
 - ✓ Initiation and planning systems;
 - ✓ Capacity-building in partner organizations;
 - ✓ Role and approach of partners;
 - ✓ Anti-corruption measures;
 - ✓ Gender policies;
 - ✓ Financial planning/follow-up.
- Assess the sustainability of the project, including value-added for Vietnamese implementing institutions.
- Assess partners' risk management during planning and implementation.
- Assess the capacity and institutional sustainability of the partners, especially the effects of the institutional capacity building provided by the Norwegian partners.
- Assess how relevant the execution of the project in was in relation to Vietnamese policies and strategies, as well as the bilateral priorities of Norwegian development cooperation with Vietnam.
- Assess coordination with other relevant activities on the ground in Vietnam.

4. Implementation of the review

The review will be carried out through reviewing written documentation as well as conducting interviews with relevant resource persons from partners, donor agencies, NGOs, government bodies, academic institutions, and Project beneficiaries. The length of field work is stipulated to one week excluding a debriefing session for the concerned stakeholders.

The review team should in particular:

- familiarize itself with academic and institutional circumstances and contexts in which the project' partners decided to collaborate;
- obtain an overview of the activities that have been conducted and the products which have been produced;
- hold discussions with Project partners jointly and if needed separately;
- hold discussions with the main Project stakeholders;

- visit field sites where research is completed (if possible). Selection made in dialogue with Project partners;
- compare Project goals and objectives with the outputs.

The review team should have proven experience in reviewing development projects, preferably from Vietnam. At least one of the team members should have working experience with issues related to climate change/environment/development.

5. Reporting

The report (maximum 20 pages, including an executive summary of no more than 3 pages) should describe the methods used and presents the findings, recommendations and lessons learned.

The draft report should be submitted by the team leader from Norad to the Norwegian Embassy maximum two weeks after the end of the mission. Time allocated for comments and date for submission of the final report should be agreed between Norad and the embassy.

6. Logistics

The review team will be responsible for arranging international travel. The team should be independent, but they will receive logistical assistance and one contact point at each institution.

Annex II: List of Questions

Questions to partners IMHEN and BCCR

Effectiveness: (To what degree are the goals achieved?)

- Is your institution more capable to simulate future changes of extreme climate events and monsoon systems? Can you eventually elaborate more on how this project has contributed?
- Has IHMENS staff increased capacity in climate modelling and climate change scenarios using NorESM and other models which are used in IPCC AR5? How many staff members have gained this increased capacity?
- Has knowledge of climate change impacts on climate of Vietnam and South East Asia increased through the project? How is such increased knowledge disseminated to potential users? Could new knowledge be used in planning and development in different sectors in Vietnam or South East Asia? If not, what can be done to promote the use of this knowledge?
- Has the understanding of monsoon system and other climate systems improved? How and to whom has such improved understanding been disseminated? Could this improved understanding be used in planning and development in different sectors in Vietnam on South East Asia? If not, what can be done to promote the use of such understanding?
- To which extent has the project promoted increased cooperation between Vietnam and Norway on this issue?
- Have the activities conducted under this project contributed effectively to achieve the goals of this project? Can you think of other activities that was not conducted that would have been more effective?
- How has our approach to monitoring, data collection, and learning affected the overall impact of the project?
- How did the project ensure accountability to beneficiaries?
- Did the project result in any policy reforms at local or national level?
- Which elements of the project could be replicated/scaled up elsewhere?

Efficiency:

- What is the value-added of this project vs. its transaction and other costs and to what extent have the resources allocated enabled the project to achieve results?
- In your view, have the funds allocated been used effectively against the goal of this project? Can you think of other ways the funds could have been used more effectively? Could these achievements have been reached with fewer resources? In case: how? Can you think of any cases of waste or unnecessary expenditures?
- This is an ODA project; does the reimbursement process of its funds meet the project schedule?
- What measures were taken to ensure cost-effectiveness in procurement and implementation

Impact: Will achievements from this project contribute positively to development in Vietnam in the future? In case: which additional prerequisites do you foresee? Which sector do you think will be most beneficial? To what extent do you think the project can contribute to development and poverty reduction in Vietnam and South East Asia?

Relevance:

- Has the project been relevant according to Vietnamese policy, needs and priorities?
- Has it been relevant to Norwegian development policies?
- Has it contributed to increased participation of women in the work in the sector of Vietnam?
- Has it had particular focus on female beneficiaries and has it contributed to fulfill the needs of female beneficiaries in particular?
- Did we do the right thing in the right way?
- What value and for whom did this project add, in the context of other creating models for climate scenarios and disaster reduction?
- Are the project objectives still relevant given achievements so far?

Sustainability:

- Will the increased capacity at IMHEN and BCCR, the new knowledge and understanding developed and the cooperation between Vietnam and Norway sustain and develop beyond the project period? If no: What should be done to secure better sustainability? If yes: which risks against sustainability do you foresee and what can be done to mitigate there?
- To what extent will activities be sustained by local beneficiaries/partners after the funding comes to an end?

Project and risk management:

- In your view: Has the project been managed effectively? Have all the activities been properly planned and effectively conducted? Could management have been working differently with better results? Has the financial management been accountable and transparent and has the financial flows been timely?
- Has communication with the donor worked properly?
- The project document identifies two risks: i) A lack of basis for receiving knowledge transfer through project and ii) Confusion of staff in the implementing agency with the regulations of sponsor. Have these two risks proved real and are they mitigated properly? In case: can you explain how?
- Have there been other, unforeseen circumstances that have threatened the project? In case, have they been handled properly?
- To what extent did grant management requirements support the delivery of results?
- To what extent did the management, decision-making and relationships structures of the project support the successful implementation of the project?
- What measures were taken to ensure effective financial implementation, monitoring and reporting?
- Can you elaborate on anti-corruption measures conducted during the project management?

Link to other relevant activities:

- Does your organization have other partnerships within the same topic, such as local implementation partners, strategic national partners or other international partnerships?
- Can you identify other relevant activities on the ground in Vietnam, and elaborate on eventual coordination with such activities?

Additionally uncategorized questions:

- Economy: before and after applying this model, is other forecast activity costs been reduced?
- Forecast activities can be done by applying different models, do you see the application bring more accurate results compared to other models?
- Is this model been used more often in modelling climate scenarios?
- Is financial support from this project help increase the appreciation of Norway in Vietnam?

Questions to implementing partners and other stakeholders

Relations:

- What is the main responsibility of your organization, and how is the sector of MONE and the work of IHMEN relevant to this responsibility?
- What is your relations to the MONE, IMHEN and this particular project?
- In which way have you collaborated with the project?

Achievements:

- What have you and your organization achieved through collaboration with this project?
- What was your expectations and are they fulfilled?

Relevance:

- Are your achievements' relevant for your work and your organization's work?
- Did we do the right thing in the right way?
- What value and for whom did this project add, in the context of other creating models for climate scenarios and disaster reduction?
- Are the project objectives still relevant given achievements so far?

Sustainability:

- Will your achievements gained in the collaboration with this project be sustainable after project end? How will you be able to take them further?
- Will your collaboration with IMHEN continue after project's end?

Questions to the Donor (Norwegian Embassy)

Effectiveness:

- Is your impression that the project has worked systematically towards all the goals and expected outcomes?
- How have they worked towards other stakeholders outside MONE, IMHEN and BCCR? Has the results been effectively disseminated to other sectors?

Impact: Have the outcomes of this project the potential to benefit the society of Vietnam? How?

Relevance:

- Is this project relevant to Vietnamese policy and priorities? – How?
- Is it relative to the need of Vietnam and the region of South East Africa? –How?
- Is it relevant to Norwegian development policy? – How
- Has the project linkages to other programs or projects supported by the embassy?

Project management:

- To which extent do you assess the project management as effective and accountable?
- Has the management implemented the project effectively?
- Has reporting been timely and accurate?
- Has information flow to the embassy been satisfactory?

Annex III: List of Interviewees

Name	Position and Organization
Dr. Martin Peter King	Senior Researcher, Bjerknes Center for Climate Change Research
Mr. Nguyen Truong Giang	Project Principal Researcher, IMHEN
Ms. Ho Minh	International Cooperation Officer , IMHEN
Mr. Nguyen Anh Tuan	Technical Specialist and Project Secretary, IMHEN
Mr. Nguyen Dinh Dzung	Official, Div. of Science, Technology and International Cooperation/Dept. of Meteorology, Hydrology, Climate Change, MONRE
Mrs. Pham Minh Thu	Deputy Coordinator, Support Program to Respond to Climate Change/MONRE-JICA project
Mrs. Vu Minh Hai	Program Manager for Building Resilience, OXFAM
Dr. Tran Thuc	Former Director of IMHEN
Mrs. Hien Thuan	Project Manager, IMHEN
Dr. Huynh Lan Huong	Deputy Director, IMHEN
Ms. Tran Thanh Thuy	Director of Training, Science and International Cooperation Div. of IMHEN
Mr. Nguyen Truong Giang,	Project Principal Researcher , IMHEN
Mr. Nguyen Anh Tuan	Technical Specialist, IMHEN
Mr. Dinh Cong Chinh	Official, Dept. of Plant, Vietnam Ministry of Agriculture & Rural Dev.
Ms. Thai Thi Minh	Lecturer, Hanoi Univ. of Natural Resources and Environment
Mr. Tran Hau Vuong	Ho Chi Minh University of Natural Resources & Environment
Dr. Jack Katzfrey,	Leader of the Csiro-project from Australia
Mr. Vu Duc Minh	Programme officer, the Royal Norwegian Embassy, Hanoi

Annex IV: List of Documents Reviewed

1. Proposal/project document
2. Agreement between Norway and Govt. of Vietnam
3. Annual report 2012 and minutes from annual meeting 2012
4. Annual report 2013 and minutes from annual meeting 2013
5. Final project report
6. Financial statements and audit reports for 2012, 2013 and 2014
7. Reports from BCCR to IMHEN 2012 and 2013

Annex V: Publications from the Project

List of publications from the project.

<p>1</p>	<p>Thử nghiệm dự tính số ngày nắng nóng khu vực Việt Nam bằng mô hình cWRF</p> <p>Phạm Quang Nam, Vũ Văn Thăng, Trương Bá Kiên, Mai Văn Khiêm Nguyễn Văn Hiệp, Nguyễn Bùi Phong, Đàng Hồng Như, Lã Thị Tuyết, Nguyễn Thị Hoan, Ngô Tiền Giang</p> <p><i>Viện Khoa học Khí tượng Thủy văn và Biến đổi Khí hậu</i></p>	<p>Tạp chí KTTV tháng 8/2015</p>
<p>2</p>	<p>High-Resolution Climate Downscaling for Vietnam with CMIP5 Data: Model Verification and Projection</p> <p>1Hiep NGUYEN, 1Thang NGUYEN, 1Khiem MAI, 2Izuru TAKAYABU, 2Hidetaka SASAKI, 1Kien TRUONG, 1Nam PHAM, 1Thang VU, 1Tuyet LA, 1Nhu DANG</p> <p>1Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN) 23/62 Nguyen Chi Thanh, Dong Da, Hanoi, Vietnam 2Meteorological Research Institute (MRI), 1-1 Nagamine, Tsukuba, Ibaraki 305- 0052, Japan</p>	<p>International Workshop on Issues in downscaling of climate change projection, Tsukuba, Japan, 5-7 October 2015</p>
<p>3</p>	<p>Đánh giá mô phỏng khí hậu tổ hợp đa mô hình trên lưới cho Việt Nam với số liệu CMIP5</p> <p>Phạm Quang Nam, Nguyễn Văn Hiệp, Vũ Văn Thăng, Trương Bá Kiên, Đàng Hồng Như, Lã Thị Tuyết</p>	<p>Tuyển tập báo cáo Hội thảo quốc gia về Khí tượng, Thủy văn, Môi trường và Biến đổi khí hậu lần thứ 18</p> <p>Viện KH KTTV&BDKH</p>
<p>4</p>	<p>Dự tính khí hậu độ phân giải cao cho Việt Nam bằng tổ hợp kết quả các mô hình khí hậu khu vực</p> <p>Nguyễn Văn Hiệp, Mai Văn Khiêm, Vũ Văn Thăng, Lã Thị Tuyết, Trương Bá Kiên, Phạm Quang Nam, Đàng Hồng Như, Đỗ Thị Nương</p>	<p>Tuyển tập báo cáo Hội thảo quốc gia về Khí tượng, Thủy văn, Môi trường và Biến đổi khí hậu lần thứ 18</p> <p>Viện KH KTTV&BDKH</p>

Annex VI : List of Consultancy Reports

TT	Danh mục	Đơn vị	Số lượng
1	Thiết lập và thử nghiệm hệ thống mô hình WRF trên hệ thống máy tính cluster của Dự án Na Uy	quyển	01
2	Chi tiết hóa dữ liệu NorESM bằng WRF, mục 1: bộ dữ liệu của NorESM được chi tiết hóa với độ phân giải 50km bằng mô hình WRF	quyển	01
3	Chi tiết hóa dữ liệu NorESM bằng WRF, mục 2: bộ dữ liệu của NorESM được chi tiết hóa với độ phân giải 50km bằng mô hình WRF	quyển	01
4	Chi tiết hóa dữ liệu NorESM bằng WRF, mục 3: bộ dữ liệu của NorESM được chi tiết hóa với độ phân giải 20km bằng mô hình WRF	quyển	01
5	Chi tiết hóa dữ liệu NorESM bằng WRF, mục 4: viết báo cáo về việc thực hiện chi tiết hóa dữ liệu NorESM bằng WRF	quyển	01
6	Chiết xuất các đặc trưng gió mùa trên cơ sở chi tiết hóa động lực bằng mô hình WRF	quyển	01
7	Tập hợp và xử lý dữ liệu nghiên cứu lựa chọn các trạm khí hậu đặc trưng phục vụ đánh giá mức độ phù hợp của mô hình và quan trắc mặt đất; tập hợp các dữ liệu về đặc trưng địa hình	quyển	01
8	Tập hợp các dữ liệu khí hậu cho tính toán và đánh giá chất lượng mô hình	quyển	01
9	Thực hiện mô hình với kịch bản phát thải RCP 4.5	quyển	01
10	Thực hiện mô hình với kịch bản phát thải RCP 8.5	quyển	01

11	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc phân bố lượng mưa, nhiệt độ	quyển	01
12	Các trung tâm khí áp mùa đông, mùa hè	quyển	01
13	Mức độ mô phỏng gió vĩ hướng, kinh hướng và tổng hợp	quyển	01
14	Chiết xuất, đánh giá mức độ thay đổi lượng mưa và nhiệt độ	quyển	01
15	Mức độ phù hợp trong mô phỏng các chỉ số hoàn lưu	quyển	01
16	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt nắng nóng	quyển	01
17	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt lạnh điển hình	quyển	01
18	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt ẩm điển hình	quyển	01
19	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt hạn điển hình	quyển	01
20	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt mưa lớn theo kịch bản RCP 4.5	quyển	01
21	Chiết xuất, đánh giá mức độ phù hợp của mô hình trong việc mô phỏng các đợt mưa lớn theo kịch bản RCP 8.5	quyển	01