Concept Note

East Africa – Peru – India Climate Capacities (EPICC)
Climate Capacity Building: Risk Anticipation and Minimization

This document summarizes the EPICC–Project by outlining central goals, outputs and potential applications for each sector around which stakeholders can orientate themselves. This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag. The Potsdam Institute for Climate Impact Research (PIK) is leading the execution of the project together with its project partners, The Energy and Resources Institute (TERI), based in New Delhi, and Deutscher Wetterdienst (DWD; German Meteorological Service), with its branch office in Hamburg.

What is the EPICC project?

The overarching goal of this project is to strengthen resilience against disruptive weather phenomena and climate change at national, regional and local level in three partner countries: India, Peru and Tanzania. This project is an opportunity for the partner countries to reduce the gap between climate research and its application in policy, business and societal decisions, particularly regarding agriculture, hydrology and water resources, and migration issues. Consequently, the project aims to identify on a collaborative basis how the results from state-of-the-art climate models and related tools can be tailored to national needs. For instance, how can climate scenarios and seasonal prediction models be applied to assist agricultural management? Or, how can migration-climate hotspot maps support strategies to reduce vulnerability to climate stressors?

Capacities to develop, use and disseminate the project results will mature through implementation with stakeholders and notably remain in partner countries for research, education, policy and decision-making purposes beyond the three-year scope of the EPICC (2018-2020).

EPICC in one sentence:
Co-production of user-oriented climate services to better adapt to climate change.

How will EPICC work?

The project encompasses five modules to be developed according to preferences and priorities of partner countries. In this sense, EPICC is adaptive to needs and capacities of local partners.

The EPICC goals are:

- Providing seasonal forecasts based on PIK research (in particular ENSO and monsoon forecasting) as well as the seasonal climate forecasts from DWD model simulations
- Climate change simulations tailored to the research areas by applying the TERI Climate Tool (TCT)[1] and bias-correction methods developed at PIK
- Assessing current and future climate impacts in particular in the water and agricultural sectors, including impacts on migration patterns
- Establishing (or enhancing) research cooperation
- Supporting local climate adaptation capacities through knowledge transfer activities

[1] The TCT is an online portal that allows the downscaling of low-resolution global climate simulations to a resolution of 25 km and provides some statistical analysis, like trend-analysis.

These goals will be reached by implementing the following modules:

1. Capacity building and knowledge transfer, as a cross-cutting issue
2. Climate
3. Hydrology and water resources
4. Agriculture
5. Migration

Module 1 (*Capacity building and knowledge transfer)* refers to the strengthening of local capacities in order to adapt to the various climate trends in all partner countries. In line with creating an open-source platform that enables a strengthening of climate adaptation capacities for other regions too, the knowledge generated throughout the project will be distributed openly. There will be a project website where results are continuously updated and visualized for project partners, sponsors and notably end-users.

The generation of knowledge on climate change in the partner countries takes place throughout modules 2-5. The module on Climate (2) provides seasonal meteorological predictions, namely statistical predictions for the Indian Summer Monsoon and the El Niño-Southern Oscillation (ENSO) phenomenon, as well as dynamical predictions based on the DWD's climate model simulations for seasonal forecasting (up to six months). In addition, longer-term trends caused by anthropogenic climate change are broken down into regional scenarios.

The modules on *Hydrology and water resources* (3) and *Agriculture* (4) use the generated data to determine the impacts of climate change on the water and agricultural sectors. This **cause-effect** analysis finds its last stage in the *Migration* (5) module. Here, the **impacts** of climate change on the named sectors are further examined and climate-migrations patterns are identified country wise.

In addition to the website, and along with scenarios and forecasts, GIS applications, maps, risk profiles and related outcomes, the project will develop scientific publications, policy briefings, press releases, newsletters and will provide political advice to stakeholders. Figure 1 shows how the modules interact.

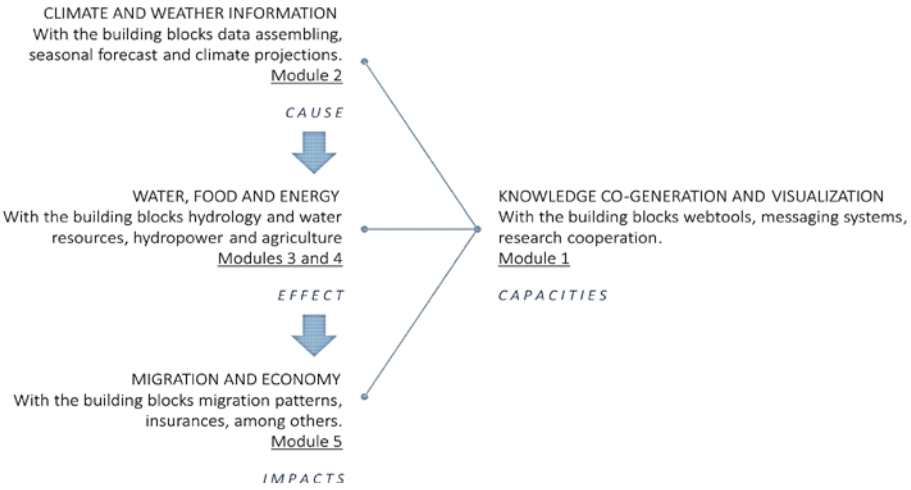

Figure 1. Modular Output for Climate Capacities

The application of EPICC's results will significantly depend on the engagement that each partner employs in the project.As EPICC aims to co-generate research-based climate services, the project will identify pathways for the development and application of new climate information based on users' needs. Hence constant involvement of project partners is crucial to successful implementation of results in research, policy, education and private structures (see next section "*How to engage with the project from a user perspective*").

Further information about the project goals, modules and activities can be found in Annex 1. Information sheet about EPICC´s modules.

How to engage with the project from a user perspective?

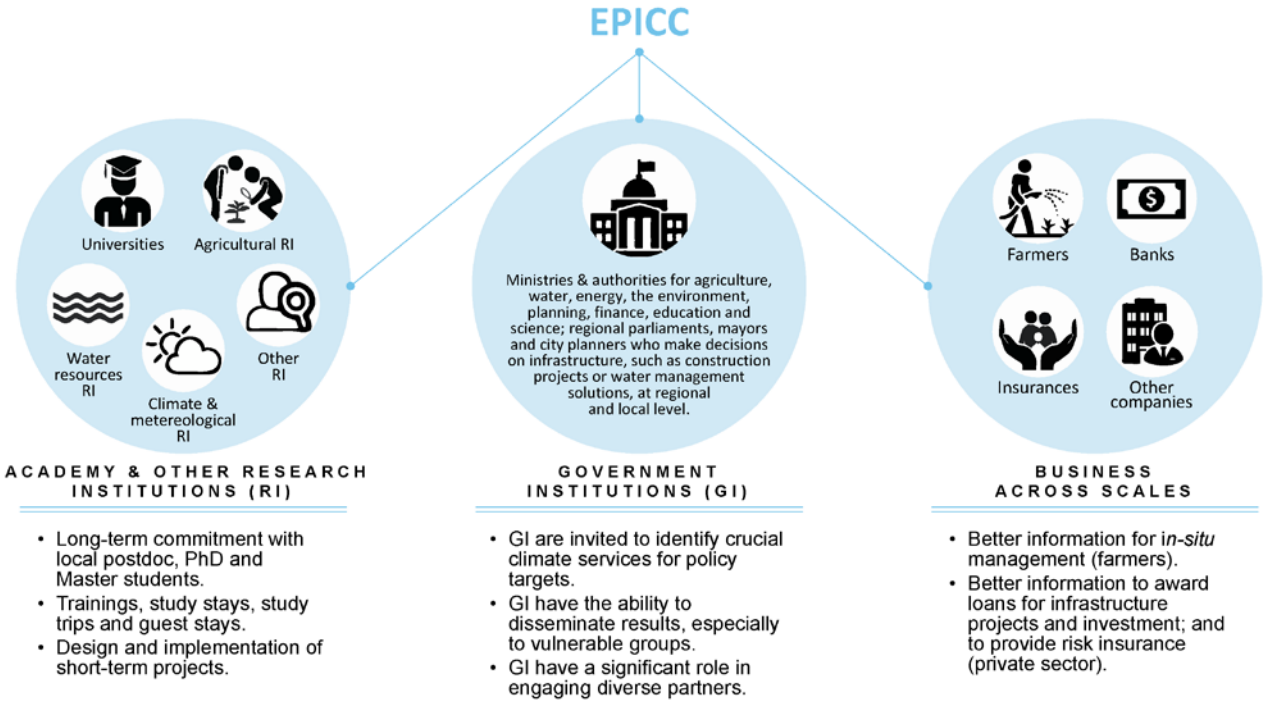

Figure 2. The role of stakeholders within EPICC

Why is your country a key partner for the EPICC project?

India

- Agriculture and food security in India are heavily dependent on monsoons. A good monsoon rain keeps the economy of the country stable. On the other hand, a two-week delayed monsoon can have catastrophic economic consequences for the country.
- Climate change could drive rural to urban migration strongly in the coming decades as rural populations livelihoods are threatened by increasing climate pressures.
- Extreme weather and monsoon variability would then lead to accelerated urbanization dynamics, with potentially high societal costs.
- India's 2008 National Action Plan on Climate Change (NAP) stresses the need to expand adaptation capacities. Furthermore, the plan's targets around water resource management (No.4), insurance measures and other adaptation practices (No. 7), climate knowledge generation and international cooperation (No. 8) can substantially benefit from EPICC.

EPICC and challenges in India | *The case of the monsoon and extreme events*

The EPICC Project can provide a newly developed method for the early prediction of the monsoon in Central India. In order to better predict this phenomenon, atmospheric data is collected, processed and analyzed, with seasonal predictions being provided by DWD. The results are made available to different users on the individual, agricultural and governmental level. The predictions are made twice a year: May and July for onset and withdrawal, respectively. The work will be first conducted for the Eastern Ghats and later extended to the state of Telangana. An additional extension is being evaluated. The extension(s) of the prediction areas is carried out in collaboration with local scientists and doctoral students. In addition TERI will test and develop new methods for climate data analysis for the improvement of the prediction of climatic extreme events.

Peru

- The long-term prediction of the El Niño phenomenon is important for risk management, including effective adaptation strategies in areas such as agriculture, infrastructure and water resources management.
- Peru's agro-ecological diversity under climate change demands precise modeling for adapting agriculture to changing conditions.
- The impacts of Peruvian glacial melt along with variable precipitation on hydrology and water resources need to be decisively considered for long-term water planning and management.
- While formulating its National Plan on Climate Change Adaptation (PNA) in 2016, Peru identified risk reduction and capacity building as the most important challenges facing the country regarding climate change.

EPICC and challenges in Peru | *The case of El Niño*

EPICC can develop an automated algorithm for the long-term prediction of the El Niño phenomenon based on a successfully tested, novel methodology, which provides predictions far earlier than current standard models (more than one year in advance). Simultaneously, EPICC will identify relevant Peruvian organizations that could integrate this algorithm into their own El Niño monitoring. Additionally, an extended algorithm – one allowing the estimation of future runs - will be developed and furthermore improved with additional data e.g. pressure or wind forces. Forecasts and algorithms are expected to be strongly supported by research groups and doctoral students from Peru.

Tanzania

70% of the natural catastrophes in Tanzania are related to climate change (INDC Report Tanzania 2015).

- National goals on climate change define *water use and irrigation to strengthen subsistence farming* and *weather forecasts and weather data management* (including seasonal time scales) as critical adaptation strategies for Tanzania.
- EPICC will be particularly supportive in terms of institutional and human capacity – two of the most laborious challenges the country face in pursuing climate change goals (National Environmental Action Plan for 2012-2017).

EPICC and challenges in Tanzania | *The case of agriculture*

EPICC can co-develop seasonal forecasting of agricultural crop yields based on DWD seasonal predictions for all partner countries. For Tanzania, such an analysis will be incorporated into the semi-empirical crop model in order to make a yield forecast one or two month prior to the harvest. Based on the model results, farmers' associations and the Ministry of Agriculture will be able to inform and assist farmers in their planning strategies in advance of an event of crop failures. Moreover, outcomes from the model will also be applied for yield loss assessments in crop insurance solutions to increase farmers' capacity to cope with climate change risks.

Additional motivations for partner countries to engage with EPICC

- The UN Convention on Biological Diversity defined as the Aichi Target 7 that by 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity. EPICC contributes new knowledge on sustainable agricultural management under climate change.
- The United Nations Framework Convention on Climate Change – UNFCCC, encourages Parties to develop and implement National Adaptation Plans (NAPs) and engage actively on capacity building instances such as the Paris Agreement Committee on Capacity Building. EPICC provides new knowledge and tools for capacity building and for the implementation of NAPs.

- Partner countries benefit from trans-disciplinary research on climate change in support of better implementation of sustainable transformation measures, for instance, those related to the UN Sustainable Development Goals.

Who could be involved?

Up to date, this proposal has identified over 20 potential partners in the fields of research, education, policy and business for Tanzania, Peru and India (Figure 3.). Institutions officially engaged are highlighted as implementation or political partners. The project objectives are geared towards cooperation with local, national and regional actors as well as their coordination and networking among each other.

In regard of international target groups, the proposal has identified active organizations in development cooperation as well as those specifically involved in climate change concerns. Finally, through the development and publication of transdisciplinary research, the international research community is also an important target group of the EPICC project which can take up and further develop approaches and methodologies developed within the project.

In 2018, the first workshop in each partner country will set the core group of collaborators and in 2019, a second workshop will be held in order to broaden the number of stakeholders involved in EPICC (see Figure 4).

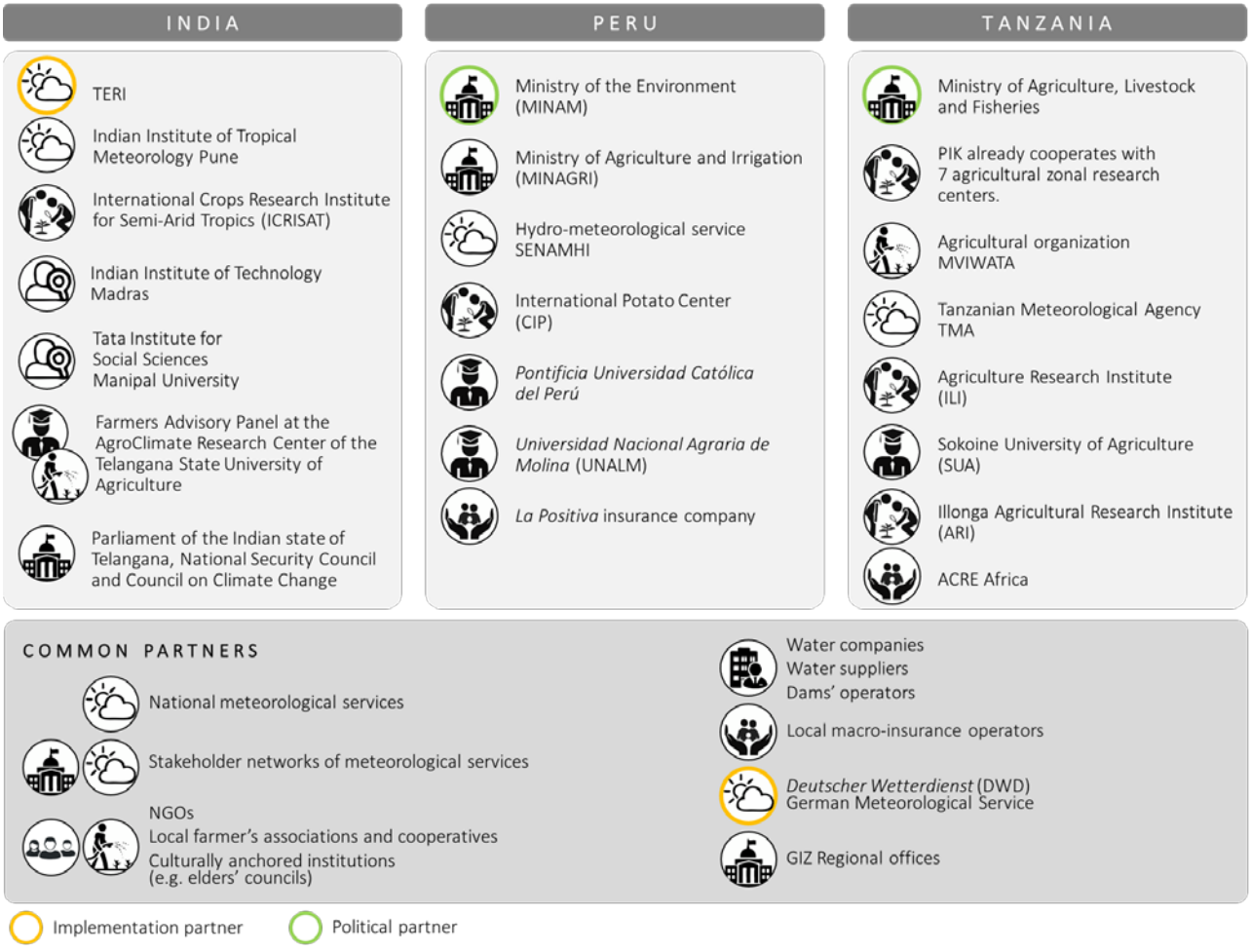

Figure 3. Implementation partners, TERI and DWD, as well as Potential partners

How will the project develop?

This last section addresses how the so far discussed modules are related to each other throughout the project. Predictions on Monsoon, El Niño and long-term climate scenarios developed in the *Climate* module will significantly feed further modeling and assessments on *Hydrology and Water resources* and *Agriculture*. On the other hand, strategic outcomes from the *Migration* module, i.e. policy briefs per country, will be completed in 2020. Finally, workshops, study stays and guest expert visits will be arranged within the Module of *Capacities Building and Knowledge Transfer*. Simultaneously, this module will foster the synthesis and integration of available climate data from PIK and related projects (2018); provide a quantitative analysis of the "climate-services-chain" (2019) and lastly, it will test the products with users and record their feedback for improvement purposes (2020).

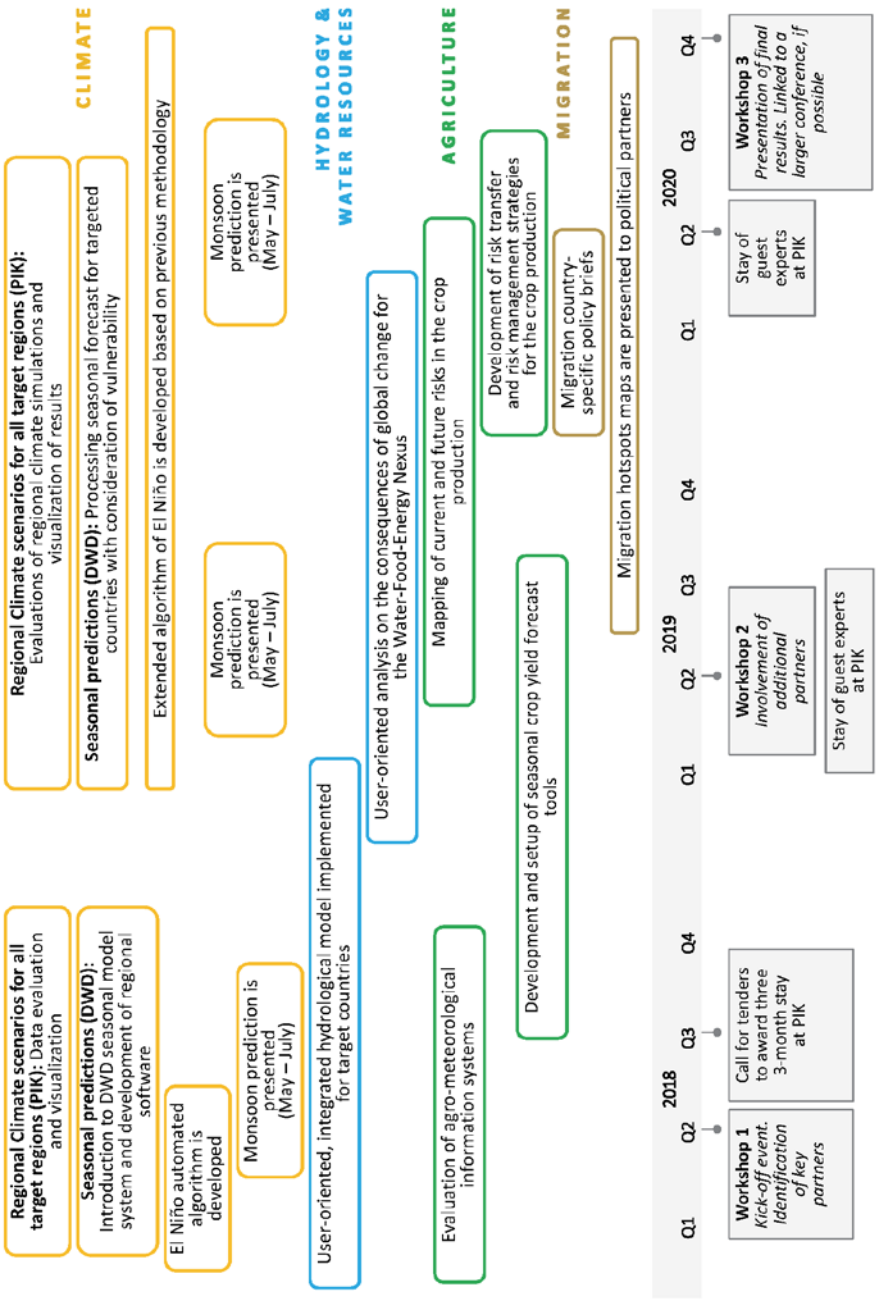

Figure 4. Workshops, study stays and some of the results expected from the project.
(Tentative timeline, updating in progress)

ANNEX 1. INFO SHEET ON EPICC´S MODULES

1) Capacity building and knowledge transfer

a) Yearly workshops in the partner countries aiming at stakeholder dialogue and scientific exchange.
b) Support of cross-sectoral web-platforms to provide information on climate impacts.
c) Funded guest stays (duration of three months) to realize short term projects for capacity building.

2) Climate services – atmospheric conditions

a) Seasonal climate forecasts (up to three months) based on the DWD (Deutscher Wetterdienst; German Meteorological Service) model to be set up for the target countries. This will also serve as input for modules 3, 4 and 5.
b) Monsoon:
   i) Medium to long-term predictions of monsoon onset and withdrawal for Eastern Ghats region in Central India.
   ii) Maps of specific locations, where weather data is needed to support the monsoon prediction for larger areas
   iii) Evaluation of the potential to transfer this method to other monsoon systems
c) El Niño:
   A long-term warning method for the onset of El Niño (which has already proved to be working over a year in advance) is built into a simple tool, making this prediction easily accessible at any given time. The method will be extended towards a more detailed prediction (explorative).
d) Long term regional climate scenarios based on model simulations for planning e.g. of future climate-resilient land use and infrastructure

3) Climate services - water resources and hydrology data and information

Climate impact information, forecasts, predictions and scenarios for the water sector and agricultural water planners, based on a user-oriented, integrated eco-hydrological model in combination with local knowledge, tailored to the needs of the target countries, providing:
a) Seasonal forecasts (up to three months).
b) Long-term impact scenarios related to the water-food-energy nexus.

4) **Climate services - agriculture and insurance data and information**

Climate impact information, forecasts, predictions and scenarios for the agricultural sector, based on a user-oriented, integrated crop model in combination with local knowledge:
a) Seasonal information on yield gaps for relevant crops and measures for minimizing them, identified through integrating modelling results with local knowledge, are provided to farmers and other target groups.
b) Seasonal predictions of crop yields and of weather factors related to agronomic decisions as the timing of sowing for farmers and the interested public.
c) Complementary information for an efficient design of crop insurance schemes to cover weather-related yield loss supplied to governments and insurance companies.

5) Migration

The impact of climate related damages in agriculture on migration dynamics is identified and analyzed to be of use for political decision making in adaptation strategies.
a) Risk analysis based on modules 2-4 and visualization in a hot-spot map.
b) Analysis of different migration patterns and their potential changes.
c) Measures for improved rural water management, agriculture, food security and livelihoods, to reduce migration pressure
c) Support for urban infrastructure, measures and institutions to better accommodate incoming migrants.

The data, information and services as well as methods will be developed jointly by PIK, DWD and local and national partners and will be made available via an online platform at PIK, possibly with mirror sites in the 3 partner countries.

ANNEX 2. PROPOSING INSTITUTION

The Potsdam Institute for Climate Impact Research (PIK) addresses crucial scientific questions in the fields of global change, climate impacts and sustainable development. Researchers from the natural and social sciences work together to generate interdisciplinary insights and to provide society with sound information for decision making.

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