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Federal Department of Foreign Affairs FDFA
Swiss Agency for Development and Cooperation SDC
Global Programme Climate Change and Environment

External Review

of the

Jinsha River Basin Integrated Water Resources and Risk Management under Changing Climate Project

Review Report

26 March 2018

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Acknowledgements

An external review of JRB project was carried out by in Beijing, Wuhan and Lijiang, from 22 to 30 January 2018, organized by the Swiss Embassy in Beijing and the Changjiang Water Resources Commission (CWRC) in Wuhan.

The review team express their sincere gratitude to the Ministry of Water Resources in Beijing, the CWRC in Wuhan, Swiss Agency for Development and Cooperation (SDC) office of the Swiss Embassy in Beijing and the SDC in Bern and the for the excellent organization of this mission. The gratitude of the team goes more particularly to Dr. Liyan WANG from the SDC and to Dr. Deng PAN from the CWRC/CRSRI, who made it possible to accomplish this mission very effectively in such a short time. The reviewers also would like to warmly thank the staff of BICST, CRSRI, BOH, CISPDR, IHE, NIEER and of the Lijiang Water Bureau for their availability and openness during the meetings and discussions. The team is also grateful to the NHRI for their written contribution as well as to the staff of EBP, HYDRIQUE and GEOTEST for the telephone interviews. This mission has greatly benefited from the guidance of Dr. Manfred Kaufmann and Dr. Jacqueline Schmid of the Global Programme Climate Change and Environment in Bern. The team also highly appreciated the outstanding support of Mr. Xi ZHANG, Chinese-English Interpreter.

Acronyms

BICST	Bureau of International Cooperation, Science & Technology
CAREERI	Cold and Arid Regions Environmental and Engineering Research Institute (recently renamed NIEER)
CAS	Chinese Academy of Sciences
CC	Climate change
CCA	Climate Change Adaptation
CISPDR	Changjiang Institute of Survey, Planning, Design and Research
CMA	Climate Meteorological Administration
CRSRI	Changjiang River Scientific Research Institute
CWRC	Changjiang Water Resources Commission
DRR	Disaster Risk Reduction
EBP	Ernst Basler + Partner
EFA	Environmental Flow Assessment
EFR	Environmental Flow Requirements
GEF	Global Environment Facility
GHG	Greenhouse gas
GPCC	Global Programme Climate Change
GPCCE	Global Programme Climate Change and Environment
GPW	Global Programme Water
GWP	Global Water Partnership
IHE	Institute of Hydro-ecology
ICIMOD	International Centre for Integrated Mountain Development
IHWC	Institute of Hydro-ecology
MOU	Memorandum of Understanding
MWR	Ministry of Water Resources of the People's Republic of China
NHRI	Nanjing Hydraulic Research Institute
NIEER	Northwest Institute of Ecology, Environment, and Resources of the Chinese Academy of Science (former CAREERI)
PIU	Project Implementation Unit
PLU	Project Leading Unit
PSC	Project Steering Committee
SDC	Swiss Agency for Development and Cooperation

Executive summary

This report presents the findings and recommendations of an external review of the first phase of the "Jinsha River Basin Integrated Water Resources Management under Changing Climate Project", implemented from March 2015 to March 2018. The review mission was carried out in Beijing, Wuhan, and Lijiang from 22 to 30 January 2018.

The Jinsha River Basin (JRB), upper part of the Changjiang River Basin, suffers increasingly from severe floods and droughts and its water balance and aquatic ecosystems are assumed to be strongly impacted by climate change. The source of the Changjiang is located in the Qinghai–Tibet plateau where the melting of glaciers and frequent landslides are issues which have not yet been sufficiently monitored and analysed.

The report first presents a brief description of the objectives, expected outcomes and outputs of the first phase of project. Then, after a review of the project documents and in-depth discussions with the project experts and key stakeholders, the reviewers present their findings concerning the projects' relevance, effectiveness, efficiency, impact and sustainability. Finally, the reviewers provide a number of recommendations for a possible second phase.

The project appears to be highly relevant. Although the goal is rather broad and could be more focused, the contribution of the Swiss expertise to improved risk management and real-time flood forecasting, long-term monitoring and modelling of glacier and snow melting, more optimal water supply management at urban level, and climate change impact assessment in the upper reach of the Changjiang basin, is highly relevant and much appreciated by the Chinese partners.

Overall the assessment of the achievements is very positive. All planned activities have been executed and some additional work has been produced. The project achieved a lot in increasing the technical capacity of the target group but was less productive in influencing planning and policy making. The project contributed effectively to the development of a solid foundation for enhanced water and risk management in the JRB and for the taking into account of climate change in the planning and design of sustainable solutions. The most effective achievement is outcome 1 while the less effective was outcome 3, which is below expectations. Trying to produce real strategies with strong stakeholder participation or influencing existing strategies and plans in the short term appeared to be too ambitious. In addition, the high uncertainty about climate change impacts in the basin, as analyzed under Outcome 2, also contributed to the poor results of Outcome 3. The concepts used for this outcome were rather weak. More attention should have been given to the fact that the basin planning process in CWRC is based on revisions of a "master plan" every 10-15 years. Concerning outcome 2, although the analysis was carried out with appropriate methods and tools, the selection of greenhouse gas emission scenarios is insufficient and there still remains high uncertainties about the evidence of climate change, in particular relating to extreme events.

While there is still some unfinished work, this phase allowed the analysis of historical data, a better knowledge of aquatic ecosystems and their sensitivity to climate change, the installation of a real-time glacier monitoring station, the development of various methods and operational tools (i.e. flood forecasting model, water allocation model, extreme events registration platform, snowmelt runoff model, hydrodynamic model, fish habitat model). Using global climate model outputs, a number of projected climate change scenarios have been proposed and the impacts have been analysed. Finally, some specific climate change adaptation measures in pilot areas have been analysed and discussed.

One of the most relevant and successful result of this phase is probably the increased capacity of the BOH for real-time flood forecasting, contributing to improved modelling capacity of reservoir operation.

Most of the deliverables have been successfully transferred and most trainings has been provided. Some transfer is still needed, namely at the level of the event registration platform and of water temperature modelling. Overall, one may conclude that the results are concretely used by the target groups and have already a positive influence on their work, contributing to an enhanced basis for planning and policy making. The project has also significant impacts in terms of improved flood forecasting and glacier

monitoring, but also in terms of increased awareness about climate change and its impacts on the water regime and on aquatic ecosystems; increased interest for non-engineering measures and increased interest for a more integrated approach.

Although several communication products have been produced (web site, study tours, factsheets, workshops, etc.), straightforward communication about the project appears to be difficult, partly because of the broad range of expected output.

Overall, the project governance and management was excellent.

The reports are clear and well-written, however, one may regret that in the current draft of the final report no recommendations are made on how to influence/improve the climate change adaptation policies.

Excellent cooperation and numerous fruitful exchanges between the various entities is also one of the greatest achievements. This project also strengthens the leadership of Swiss expertise relating to climate change in mountainous regions and contributes to the excellency of the relations between China and Switzerland at high level.

The Chinese partners are very satisfied with the outcomes of the first phase and there is a strong expectation for a second phase.

Considering the successful achievements of phase I and the interest expressed by the Chinese partners, the reviewers recommend preparing and implementing a second 3-year phase building on the most successful achievements of the first phase. Several topics have been discussed and listed in the section on recommendations.

A comprehensive demand-driven project identification and preparation is needed, based on extensive consultations of key stakeholders and taking into account both the priority needs of China and the strategic objectives of the Swiss Global Programme Climate Change and Environment (GPCCE).

It is recommended to continue to work at the technical level with a view of enhancing the foundation for climate change adaptation planning and policy making. However, a more focused second phase, highlighting the competitive advantages of the Swiss expertise, would be preferable. Four options are suggested:

1. Option 1: A project focusing mainly on Risk Management (Floods and Droughts) and multipurpose reservoir operation in the JRB with possible outreach to other sub-basins, considering understanding of climate change impacts on the hydrological extremes in the basin. The hydrological modelling would also be improved/refined so as to include mid-long-term hydrological predictions based on mid-long-term prediction of precipitation.
2. Option 2: A more scientific project focusing on longer-term glacier monitoring and modelling in the upper reach of the JRB or more widely in the Qinghai-Tibetan plateau.
3. Option 3: Further work on generating more reliable evidence of climate change and climate change impacts in the basin.
4. Option 4: Combination of option 1 and 2.

Finally, to ensure easier communication about the project, it is recommended to formulate only one specific and more straightforward objective

1 Background and context

1.1 Introduction

This report provides the findings and recommendations of an external review mission carried out in Beijing, Wuhan and Lijiang from 22 to 30 January 2018 by Prof. Olivier Cogels, Team Leader, International Expert in River Basin Management and Water Diplomacy, Professor Emeritus at the Catholic University of Louvain, Belgium; Prof. Yangwen Jia, Vice Director of the Department of Water Resources of the China Institute of Water Resources and Hydropower Research; and Prof. Jie Chen, Professor at the School of Water Resources and Hydropower Engineering of Wuhan University.

The JRB project is a complex project with many partners and outputs. The reviewers hope that the critical comments provided about the first 3-year phase and the formulated recommendations will be useful for feeding constructive discussions about a possible second phase.

1.2 SDC's Global Programme Climate Change and Environment (GPCCE)

The preservation of natural resources is enshrined in Article 54 of the Swiss Constitution, and the promotion of sustainable development, poverty reduction and prosperity is an integral part of the Swiss Foreign Policy Strategy for 2016–2019. The Dispatch on Switzerland's International Cooperation 2017–2020 highlights the link between sustainable development and climate change and includes provisions to strengthen the environmental dimension of the Swiss Agency for Development and Cooperation's (SDC) development efforts.

Recently the name and mandate for the Global Programme Climate Change (GPCC) has been changed to the Global Programme Climate Change *and Environment* (GPCCE) to better highlight that addressing climate change challenges must go hand-in-hand with limiting the negative effects from growth and development on the environment.

Along with other actors of Swiss development cooperation, GPCCE initiatives actively support partner countries in their transition to a low carbon, environmentally sound and climate resilient development. One of the key questions is how to grow while keeping natural resources intact. GPCC has been active at multilateral, regional and national levels in various parts of the world. On the national level, GPCC efforts, from 2013– 2016, helped achieve major results in areas where Switzerland brings recognized expertise. GPCC has been particularly successful in transferring its expertise in climate change mitigation and adaptation into national policies, global initiatives and multilateral processes, and in leveraging these global dynamics to foster local action.

The strategic orientations of the GPCCE for the coming years are presented in Its Strategic Framework 2017–2020. GPCCE's overall mission is to contribute to low-emission and climate resilient development promoting access to clean energy for all and sustainable management of natural resources. The strategy has 3 components and one transversal component:

- Component 1: Climate and environment policy and planning
- Component 2: Low-emission development
- Component 3: Climate-resilient development and sustainable natural resource management
- Transversal component: Climate Change and Environment in Development Cooperation

GPCCE has a three-pronged approach of policy influencing, innovation and knowledge management. Drawing from its experience, GPCCE aims at contributing to designing policies and regulations that address solutions to climate change and environment issues.

GPCCE develops synergies with other Global Programmes including the Global Programme Water (GPW), ensuring water availability under a changing climate and strengthening climate information systems for water related adaptation planning on glaciers. In Asia, GPCCE focuses particularly on India and China.

1.3 Cooperation between China and Switzerland

Switzerland and the People's Republic of China have maintained bilateral relations since 1950. Cooperation in areas of environment dates back to 2003. In 2007, Switzerland and China signed a Memorandum of understanding (MoU) to intensify high-level political consultations and strengthen bilateral dialogues across a wide range of areas. In 2009 the two countries formalized the cooperation and signed a MoU on water management and hazard prevention. By recognizing that Switzerland and China are significantly affected by the impacts of climate change on the water resources, they extended their cooperation in this area.

With increasing political willingness for economic growth going hand in hand with quality, China's water resources management is definitely shifting from a full-engineering approach to more concern for sustainability and environment conservation. In recent years, water management is becoming more integrated, more multipurpose, with more consideration for environmental flows and protection of ecosystems. China is also being increasingly concerned by the consequences of climate change. In this Context, the joint project "Jinsha River Basin (JRB) Integrated Water Resources and Risk Management under Changing Climate" has been approved by the Chinese MWR and SDC in order to improve integrated water resources and risk management in the Changjiang river basin. The project was launched in 2014 with an opening phase from February 2014 to August 2014, followed by a phase I from March 2015 to end of 2017. This main phase was extended to mid of 2018, to allow for a final dissemination conference in May 2018 and preparation of follow-up activities.

The JRB project is to certain extent a continuation of previous three successful bilateral projects, the Glacier Outburst Lake Flooding Project, the Dam Safety Enhancement Project, and the Hanjiang Flood Risk Management Project.

2 Brief description of the JRB project

The Jinsha River is the upstream of Changjiang River, stretching from the Qinghai-Tibetan plateau in the west to lowland region in Sichuan Province at the Eastern edge of the Himalaya range. The Basin covers an area of 540.000 km^2. The population of the basin is about 22.54 million people. The basin crosses five provinces/autonomous region, namely, Qinghai, Yunnan, Sichuan, Guizhou and Tibet (Fig. 1). The local water regime is greatly influenced by glacier and climatic variability. During the last 2-3 decades, the region has experienced sever extreme events (primarily drought and floods in the tributary catchments) causing significant economic loss.

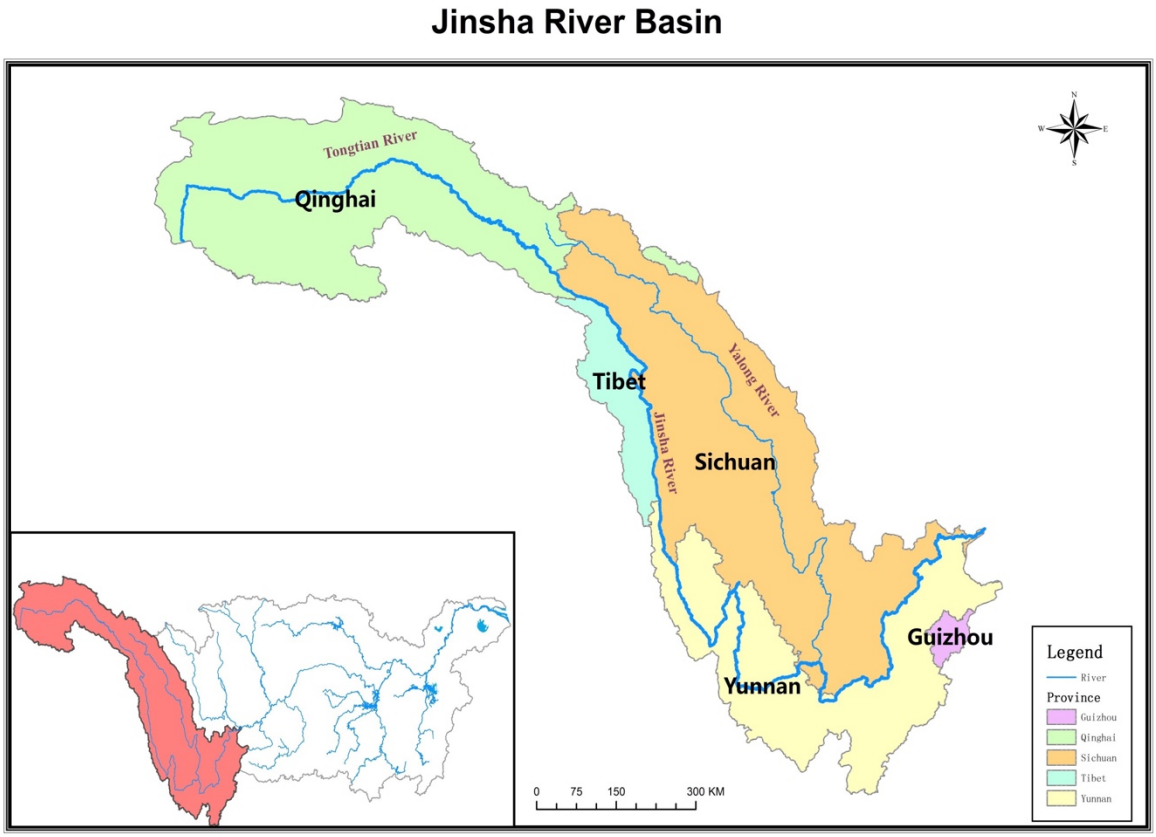

Fig.1 Location of Jinsha River Basin (map from the project report)

The long-term objective of the project is:

To improve the integrated water resources and risk management framework (IWRM) for the Jinsha River Basin (JRB) under conditions of changing climate and social-economic development.

The Specific objectives are:

To develop methods and models to enhance the water management practices for the Jinsha river basin and to enable adaptation strategies and measures to climate and socio-economic change.

The expected outcomes are:

- Outcome 1: Knowledge of water dynamics (hydro-meteorological and demand-based, e.g. by enhanced monitoring) and forecasting for management of water resources in the Jinsha River Basin are substantially improved;
- Outcome 2: Impacts of climate change on water supply and extreme events are identified and analysed;
- Outcome 3: Adaptation strategies and measures to climate change for water resources and flood control and drought relief based on risk management are developed and assessed, including but not limited to cascade reservoir operation and management;
- Outcome 4: An international platform for knowledge and expertise exchange on water resources management and climate change adaptation that discusses on going work and draws out lessons and understanding relevant to efforts to adapt to climate change elsewhere in the world is operating involving Swiss and Chinese experts.

The Work Breakdown Structure is summarized in the figure below (Fig. 2).

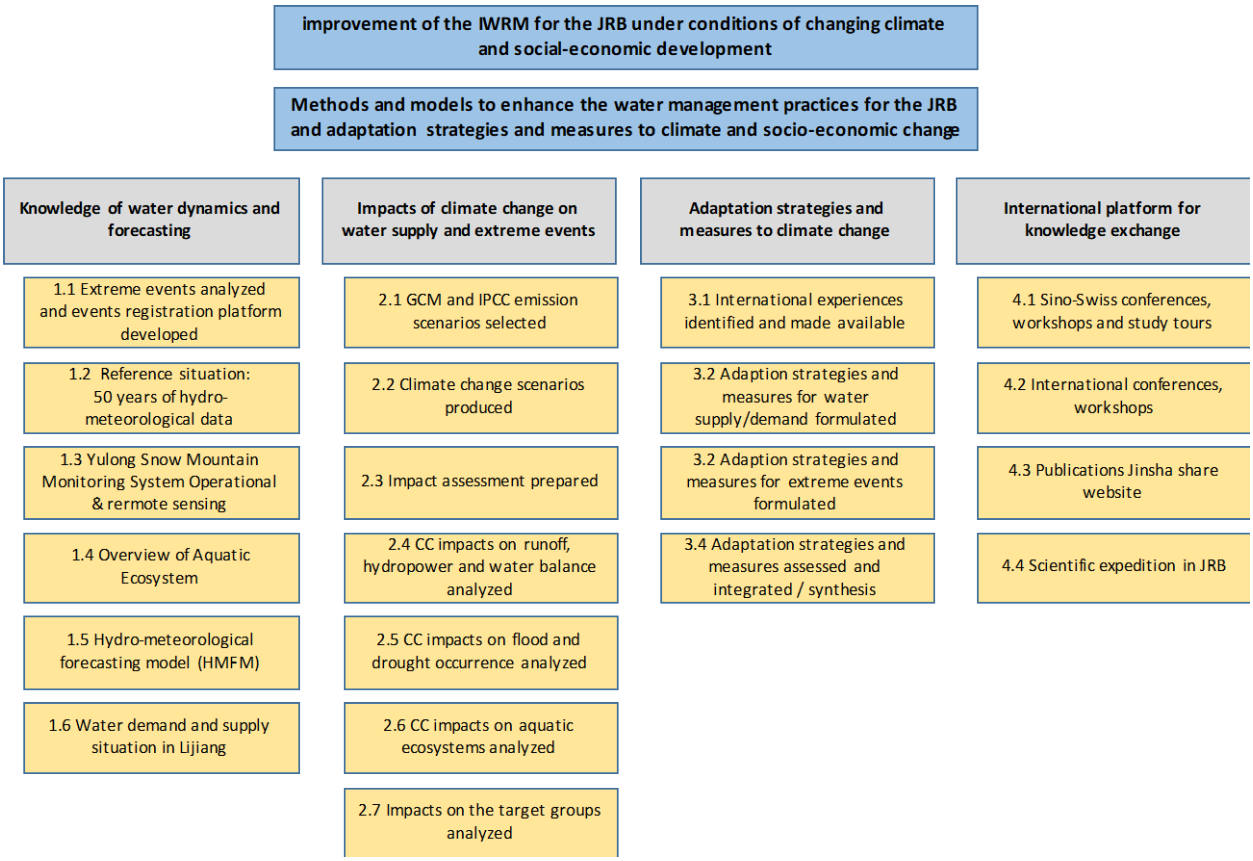

Fig. 2 The project Work Breakdown Structure

The list of detailed outputs and deliverables (indicators) is provided in annex 1. The project partners are shown in the figure below (Fig. 3).

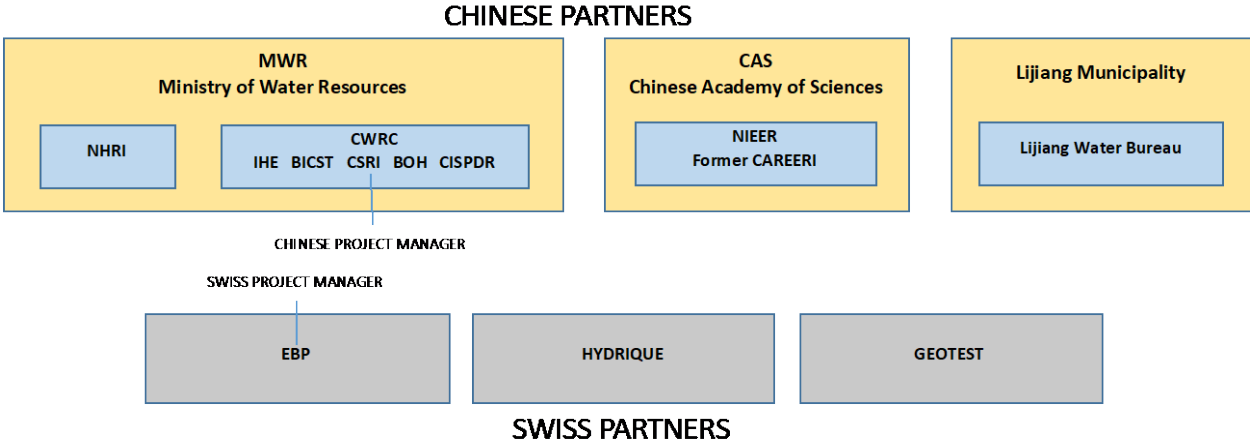

Fig. 3 The project partners

The leading Swiss implementing entity is the EBP company, in partnership with GEOTEST and HYDRIQUE. The Chinese implementation partners are:

- Ministry of Water Resources (MWR)
  - CWRC: Changjiang Water Resources Commission through its following entities:
    - BICST: Bureau of International Cooperation, Science & Technology

        - CRSRI: Changjiang River Scientific Research Institute
        - BOH: Bureau of Hydrology
        - CISPDR: Changjiang Institute of Survey, Planning, Design and Research
    - IHE: Institute of Hydro-ecology
    - NHRI: Nanjing Hydraulic Research Institute, who hosts the climate change center of the Ministry of Water Resources
- Chinese Academy of Sciences
    - NIEER: Northwest Institute of Eco-Environment and Resources; formerly the Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI)
    - CAREERI
- Lijiang Municipality
    - Lijiang Water Bureau

On the Chinese side, the leading implementing entity is CRSRI and BICST being in charge of overall coordination.

Project is co-managed by a Chinese project manager and a Swiss project manager.

The project is executed under the supervision of the Swiss Agency for Development and Cooperation, and the Chinese Ministry of Water Resources, both represented in the Project Steering Committee (PSC).

The project governance structure is presented in the figure below (Fig. 4):

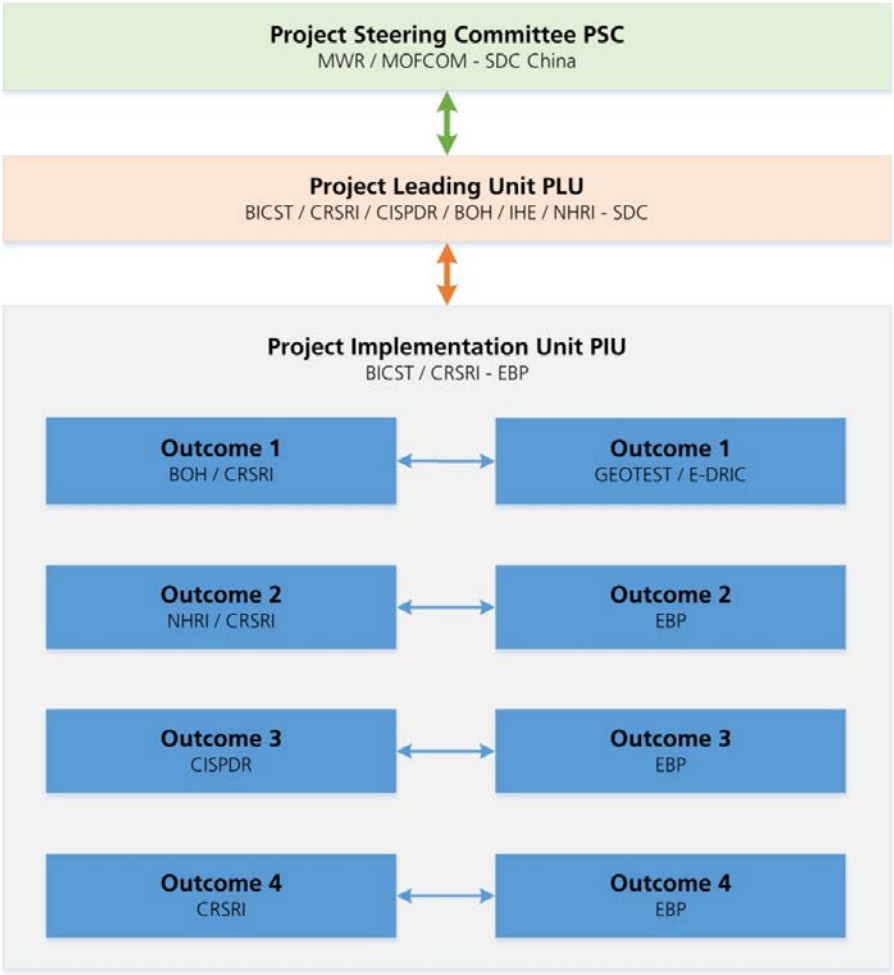

Fig. 4 The project governance structure (figure from the project report)

3 Review objective and process

3.1 Objective of the review

The objective of the external review is to give an independent assessment of the project, focusing on below five aspects, to answer the listed questions:

Relevance

1) Does the project meet the practical management needs of the CWRC? Is the project relevant or in line with China's national river basin management strategy?
2) Are the activities and outputs of the project consistent with the overall goal and the attainment of the objectives, and the intended impacts and effects?
3) Will the project have regional or global relevance in knowledge sharing for other river basins in China and potentially other countries?

Efficiency

4) Were the objectives achieved, and in a cost-effective way?
5) Is the project working with the best arrangement of partners?
6) How do you assess, critically, the performance and the capacity of the implementation partners, and the cooperation relations between the Swiss and Chinese teams, as well as the project management in general?

Effectiveness

7) What are the major results/findings/achievements so far generated directly from the project? Have the outcomes/outputs envisaged been achieved?
8) Critically assess the quality of the project outputs and activities, and their relevance to the project outcomes
9) Identify areas with potential for improvement

Impacts

10) To what extent the project results may influence CWRC's water resources management, e.g. in terms of hydro-meteorological forecast, water dynamics monitoring, eco-system protection, plans for adaptation measures, both engineering and non-engineering?
11) What results have been used or have potential to be used by CWRC and other river basins in China?
12) To what extent the projects may have impacts beyond China? Is there a potential to feed results into policy-dialogue processes on the regional or global level?
13) Critically assess project communication and knowledge management in terms of quality of knowledge products, publications, outreach of project website and social media.

Sustainability

14) What results and processes have been used or have potential to be shared with other river basins in China?
15) What actions are still most urgently needed (gaps) to establish very solid results in order to further enhance integrated water resources and risk management,
16) To what extent was technical and institutional know-how transfer achieved? Will the Chinese partners in the future still rely on technical expertise from Swiss partners to implement the findings of the project or to expand its focus to other river basins?

Based on above assessment, the reviewers are expected to give a set of recommendations for the strategic orientation for a possible 2nd phase (1-3 years) of JRB project, or even for a new project. The recommendations have to be well developed, evidence based, practical and feasible for implementation. They should include objectives, target regions and opportunities/gaps that could be filled with Chinese and Swiss expertise.

3.2 Review process and programme

After receiving the various project documents and reports, the reviewers first carried out a preliminary desk review in January. All project reports are available on-line on the Jinsha Share web-platform. On this basis and according to the mission ToR, the team leader prepared a first draft of a detailed questionnaire for conducting telephone/skype interviews. In January, the team leader interviewed by phone the key staff of EBP, HYDRIQUE and GEOTEST. This was wrapped up by telephone with the SDC Global Change Programme officers in charge of the JRB project in Berne.

On 22 January 2018 in Beijing, a briefing was held at the SDC office of the Swiss Embassy with the Head of cooperation and the key staff in charge of the follow-up of the project. On 23 and 24 January, in Wuhan, the team held several meetings and discussions with BICST, CRSRI, CISPDR and IHE. The team could not meet with NHRI, who provided a written input.

On 25 January, the team then travelled by plane to Lijiang, accompanied by key staff of BICST and CRSRI. On 26 January the team visited the glacier Monitoring station on the Yulong Mountain together with Prof. Yuanqing He and staff of NIEER (former CAREERI).

This visit to the glacier was followed in the afternoon by a meeting at the Lijiang City Water Bureau.

After returning to Beijing by plane on the 27th, the team held on 28 January 2018 a wrap-up meeting at the SDC office with the support of Dr. Liyan Wang. A preliminary draft report was finalized on Monday 29 and send to the Embassy.

On Monday 29 afternoon a debriefing meeting was held at the SDC office with the participation of the Head of the International Cooperation and his staff, representatives of the Ministry of Water Resources and of the Ministry of Commerce, as well as staff of the CWRC. On 31 January, a short meeting was held between the team leader and Dr. Liyan Wang to further clarify some elements of the preliminary draft report.

The mission programme is summarized in the table below (Table 1).

Table 1: Mission programme

Time	Location	Activity
Monday 22 January	Beijing Beijing - Wuhan	Briefing at the Swiss Embassy. Travel by train from Beijing to Wuhan.
Tuesday 23 January	Wuhan	Meetings, interviews and visits with BICST, CRSRI and BOH.
Wednesday 24 January	Wuhan	Meetings, interviews and visits to CISPDR and IHE.
Thursday 25 January	Wuhan - Lijiang	Travel by plane from Wuhan to Lijiang.
Friday 26 January	Lijiang	Meeting with NIEER and visit of the glacier monitoring station on Yulong mountain. Meeting with Lijiang Water Authority.
Saturday 27 January	Lijiang - Beijing	Travel by plane from Lijiang to Beijing.
Sunday 28 January	Beijing	Wrap-up and preparation of preliminary draft of the report.

Monday 29 January	Beijing	Preliminary draft of the report and debriefing at the Swiss Embassy.
Tuesday 30 January	Beijing	Brief follow-up discussion at the Swiss Embassy.

The list of meetings and participants is presented in Annex 2.

The detailed questionnaire is provided in Annex 3.

4 Key findings

The table hereafter (Table 2) presents the key findings of the external review compliant with the format of the assessment grid. As compared to this grid and as requested in the ToR, an assessment of impact of the use of the results has been included after the assessment of effectiveness.

Table 2: Key findings

Assessment of relevance	
To what extent are the objectives of the project consistent with the demands and the needs of the target groups (incl. gender-specific requirements)?	• The overall objective and choice of project area was done by the Chinese Ministry of Water Resources and the CWRC. At that time, China was facing severe droughts and floods. Big disasters occurred in several provinces, including in the Jinsha basin. China was very interested in the Swiss expertise because the mountainous Jinsha region has a lot of similarities with Switzerland. • China is affected by impacts of climate change and of socio-economic development (infrastructure development, land-use changes, urbanization, etc.). In China, the impacts of rapid socio-economic development are more significant than the impacts of climate change. But since the project is funded by the Global Programme Climate Change and Environment, it is fully understandable that the focus of this project is essentially on climate change. Keeping this in mind, the idea of contributing with high-level and renowned Swiss expertise to improved risk management, monitoring and modelling of glacier and snow melting, more secured water supply in Lijiang, and climate change impact assessment in the upper reach of the Changjiang river basin, is highly relevant and much appreciated by the Chinese partners. • The title and the long-term objective mention *Integrated Water Resources Management*, which usually implies also activities relating to stakeholder participation, sharing of information, inter-sectorial cooperation, etc. As such activities are not really included in the project, the title could have been more focused. The formulation of the objectives mentions also *socio-economic development conditions and change* although, as said above, only the impacts of climate change are considered. Complex socio-economic modelling is indeed not included in the project. • The specific objectives are formulated as being twofold: 1) developing methods and models and 2) developing adaptation strategies and measures. It appeared that the second objective was probably too ambitious, at least for what concerns basin planning. Indeed, the Changjiang river basin planning cycle is based on revisions of the master plan every 10 to 15 years. The first round was achieved in 1959, the second round in 1990, the third round in 2005 and the last revision was approved by State Council in 2012. The fourth revision has not started yet. This constraint could have been identified during the design of the project, which would have avoided some expectations which could not be met. • It would have been more striking to formulate *only one specific objective* focusing on the technical capacity of the CWRC, the Water Bureau of Lijiang Municipality, and the NIEER. A more straightforward formulation could have been: "*developing a sound basis for risk management and climate change adaptation in the JRB".* Let's remind that in CWRC, the target groups are only the *technical arms*, who are in charge of advising the *administrative and policy making arms* (i.e. Planning Bureau, Water Resources Bureau and Flood and Drought Control Office), who were not really involved.

To what extent are the objectives consistent with the demands and the needs of partner country and with their sector policies and strategies?	• The project meets China's demand for Swiss technical and methodological expertise (in mountainous areas) to contribute stepwise to the broader goal of climate adaptation in the basin. • The project is in line with the Chinese infrastructure development and water management strategy. • The project well meets China's demand for adaptation to climate change (*Action Plan for Cities to Adapt to Climate Change*, 2016, National Development and Reform Commission of China; *China's National Climate Change Adaptation Programme*, the State Council, 2007), which requires water resources management and flood-control/drought relief to consider the impacts and adaptation of climate change, especially the extreme drought and flood events. • The project (the Lijiang pilot study) is quite consistent with China's policy for water resources management (*The Guidelines on Implementing the Stringent Water Resources Management System*, the State Council, 2012), which requires to draw and obey the three red lines of water resources management to control total water use, improve water use efficiency, and control water pollution. • The project (the aquatic ecosystem study) is highly in line with China's strategy for ecological protection (*The Construction of Ecology Civilization as one key component of the National Five-in-One Overall Strategy*, i.e., Politics Civilization, Economy Civilization, Society Civilization, Culture Civilization and Ecology Civilization, 2012; *Water Pollution Control Action Plan*, the State Council, 2015), which requires to determine and guarantee eco-environmental flows of major rivers and lakes. • The project (glacier monitoring and HMFM) well meets MWR's demand for enhancement of national monitoring and control capability of water resources (*Programme of National Monitoring and Control Capability Construction of Water Resources*, MWR, 2012-2014 Phase I, 2016-2018 Phase II). • The project is greatly consistent with MWR policy for promoting the construction of water ecology civilization (*The Guidelines on Quickly Promoting the Construction of Water Ecology Civilization*, MWR, 2013), which aims to contribute the national ecology civilization construction through the enhancement of water ecology protection and rehabilitation.
To what extent is the project design (project structure) adequate to achieve the goal and objectives in terms of choice of approach and operational elements, articulation of components, choice of partners, and consistent with SDC policies and experiences?	• Project preparation started with a joint one week planning mission in 2013 in the project area. While there has been sufficient consultation of the various CWRC technical entities, taking into account their priority needs, the involvement of local stakeholders was rather limited. It would have been useful to involve more some local partners such as Dam Exploitation Company, but this appeared to be difficult. This would be important for a second phase. • The project has been mainly designed on the basis of a clustering of expertise of three Swiss partners (GEOTEST, HYDRIQUE, and EBP) involved in three previous successful projects: the Glacier Outburst Lake Flooding Project, the Dam Safety Enhancement Project, and the Hanjiang Flood Risk Management Project. This explains some lack of coherence and between the various outputs. • It seems that the project structure did not allow easy communication. Another structure project could have been the grouping in one outcome of all activities aiming at improved real-time hydro-meteorological forecasting and risk management, and in another outcome all activities focusing on the monitoring and assessment of climate change and

	climate change impacts (historical data analysis and registration of extreme events, use of the GCM models, installation of glacier monitoring equipment, assessment of impacts on fish habitats, etc.). • As said already in the previous section, the idea of including an outcome on strategic planning and adaptation measures appeared to be too ambitious for a first 3-year phase. This outcome (outputs 3.2 to 3.4) has been poorly prepared. Supporting strategic planning and identification of design measures needs to be achieved in the scope of *existing planning processes*. A more in-depth analysis of the existing planning and policy making processes (and revision timeframe), existing institutional arrangements, capacity and tools, including the models used by CISPDR for planning and design, as well as the workflow between the technical entities and the Flood and Drought Control Centre would therefore have been necessary. • This being said, all outputs aim at contributing to a sound basis for improved water and risk management and for a better taking into account - in the longer term - of climate change impacts in the planning and design of sustainable solutions. • Considering that the source of this longest river in China, third longest river in the world, is located in the Qinghai–Tibet plateau where the melting of glaciers and frequent landslides are issues which have not been sufficiently monitored and analysed, it was worthwhile to add a component on glacier and snowmelt monitoring and modelling. However, since only one station cannot be representative of such a big area, it has mainly a high demonstrative and scientific value. China has a lack of such monitoring data. • The basin being very sensitive to extreme events, developing a more performant model for real-time hydro-meteorological forecasting and reservoir management is very relevant and useful. • Adding a component on aquatic ecosystems appeared also relevant since fish habitats, strongly affected by the operation of hydropower dams, have not received sufficient attention in the past. However, it would have been useful to include also an output on habitat conservation measures in relation to dam building and operation. Furthermore, other ecosystems (not only fish habitats) would also require more attention. • Considering that the identification of reliable and convincing “evidence” of climate change - particularly regarding extreme events - is very fundamental, a stronger involvement of top-notch climate scientists and climate centres in China and in Europe would probably have been appropriate. • Including a literature review of international experiences was not very relevant since this kind of knowledge is supposed to be mastered by the experts involved. Instead, more research on the historical evidence of climate change relating to extreme events in China and in other parts of the world would probably have been more useful. • The governance and management structure and arrangements have been very well designed. • The project content is a very consistent with the strategic objectives of SDC’s Global Programme Climate Change and Environment.

Assessment of effectiveness	
Progress of achievements of outcomes: To what extent have the planned objectives at outcome level been achieved, taking into account their relative importance?	• Overall the assessment of the achievements is very positive. All planned activities have been achieved and some additional work has been produced including: o Snowmelt runoff modelling; o 2D Hydrodynamic modelling and fish habitat simulation modelling. • The major tangible achievements/deliverables are: o Collection, harmonization and analysis of historical data in the JRB since 1950; o Operational state-of-the art glacier monitoring station on the Yulong Mountain; o Snowmelt Runoff Model; o Operational state-of-the art Hydro-Meteorological Forecasting model (HMFM) used in real time (RS 3.0); o Web based registration platform for extreme events (not yet transferred); o Overview of aquatic ecosystems in the Jinsha River and 2D Hydrodynamic model and fish habitat simulation model; o Water Evaluation and Planning Model (WEAP) for Lijiang pilot area; o Medium and long term projections of climate change based on two emission scenarios and outputs of a selection of Global Climate Models; o Estimated impacts on flood and drought occurrence and on aquatic ecosystems; o Study on international experiences from climate change adaptation in river basins; o Assessment of adaptation measures in selected pilot areas; o Communication products: website, factsheets, workshops, study tours, trainings, conferences. • The excellent cooperation and exchange between the various entities is also one of the greatest achievements of this project. • The project achieved a lot in increasing the technical capacity of the target group but was less productive in influencing planning and policy making. The most affective achievement is outcome 1 while the less productive was outcome 3 (outputs 3.2 to 3.4). • The high-quality methods and models developed during these 3 years contribute indeed significantly to build a sound technical basis for real-time monitoring and flood forecasting as well as for longer term basin planning and policy making. • The results of outcome 2 are a bit frustrating because of the high uncertainty about climate change and climate change impacts. • The achievements under outputs 3.2 – 3.4 are clearly below expectations. Initially the team expected to be able to elaborate real strategies with strong involvement of local stakeholders. However, this activity was not well evaluated and designed during project preparation. The weakness of this outcome can also be explained by the fact that master plans in China are designed in a top-down approach (from national strategy, to regional strategy, etc.) and by the fact that the

	Changjiang river basin planning cycle is based on a 10 to 15-year revision of the master plan. Furthermore, the climate adaptation strategy is the responsibility of the National Development and Reform Commission of China. • To overcome this difficulty, the team decided to concentrate their work at a more local scale in a number of pilot areas, but in a late stage. • Project governance and management was excellent with only some minor issues regarding the format of the two first PSC meetings. • The reports are clear and well-written, however, one may regret that in the current draft of the final report no recommendations are made on how to influence/improve the climate change adaptation policies.
Assessment of the quality of Outcome 1: Knowledge of water dynamics and forecasting	Outputs 1.1 and 1.2: Analysis of hydro-meteorological data and registration of extreme events. • It was a real challenge to collect and harmonize data and information on hydrological extreme events (droughts and floods) in the JRB (the observed time series are available only since the 1950s). Events prior to 1950 could hardly be found. The data is now accessible and shared among the partners. • The analysis of the existing hydro-meteorological data allowed a good calibration of the hydrological model. • The team used appropriate statistical analysis tools and methods but due to limited data, the conclusions are characterized by a high degree of uncertainty. The conclusion of no trend for drought events seem to contradict the perception of more continuous droughts in the region from 2009-2015. However, the team concluded that the recent droughts were not the worst because drought episodes around 1940 experienced the same intensity and duration. • An analysis of other historical datasets (e.g. global gridded observations) outside the JRB in China (not carried out in this project) would probably have generated more confidence in the conclusions, which is fundamental for impact analysis and identification of adaptation measures. Working on this with the Chinese Climate Meteorological Administration (CMA) would probably have been useful. • The conclusion that only the discharge at Huatan station shows a significant positive trend should put emphasis on the discharge process due to the construction of hydropower stations. • A user-friendly web-based registration platform for the registration of extreme events (various types of events) has been constructed by the Swiss team. However, this output has not yet been transferred to the Chinese partner. • The attribution of changes in water resources, droughts and floods are only partly due to climate change and more infrastructure building, water use increase and socio-economic development. Output 1.3 Snow and glacier monitoring station and remote sensing • The work under output 1.3 has been achieved very effectively. • The automatic terrestrial glacier monitoring station was successfully installed by highly specialized staffs and the ownership and maintenance by the NIEER has been ensured.

	• Unfortunately, there has been a lot of unexpected snow which has damaged the station. One camera has to be newly configured. NIEER hired a local engineer and its working on it. • A Snow Runoff Model (SRM) was applied to analyse the relationship between snow coverage and runoff in the headwaters of JRB using satellite data. This output is an additional contribution, which was not requested in the initial project document and which has to be considered as exploratory work. Output 1.4: Overview of aquatic ecosystems • The team has achieved excellent work on fish species and fish habitats. • The quality and changes of aquatic ecosystems with a focus on fish communities and habitats was well summarized and assessed. • This is the first comprehensive overview of aquatic ecosystems in the Jinsha River, showing rapid degradation. Output 1.5: Short to Long-term Hydro-Meteorological Forecasting model (HMFM) • A hydro-meteorological forecasting model at long, middle and short term has been built and calibrated for JRB region. It has been incorporated into the existing hydro-meteorological forecasting system of CWRC. The Routing System model, known as RS 3.0 runs operationally on a 24 hours and 7 days' basis at the BOH office as a complement to several other models such as Mike 11 of the Danish Hydraulic Institute. This is probably the most tangible and useful achievement for the CWRC in their daily work and may be considered a very relevant and high quality achievement, leading to real time operational use and bringing a strong value-added in the existing hydro-meteorological forecasting toolbox of the BOH. • One element did not work well, which is the medium-term prediction. This is due to the limitations of the meteorological forecasting. There is still some weakness at the level of data control. Data are collected automatically and data quality is needed. There is still a need of 1-2 trainings. This is also an issue of staff turnover. • BOH has this kind of system already operational for the whole Changjiang river basin (in the mainstream and for major tributaries), and the RS model is considered as an effective additional tool in their toolbox, according to the principle that there is no one-size-fit-all solution. • There was already a forecasting tool which needed to take into account the upstream part of the basin. The forecasting was limited to a couple of hours and is now possible at 10 days. Long term (several months) predictions is now also possible. The model also allows to better connect the dams to the watershed. • The results of the flood forecasts are sent to the Flood and Drought Control Office where forecasters take the decisions on the basis of various inputs and criteria. This is how the technical support provided by the project to the technical arm of the CWRC may influence decision-making at the level of the administrative and policy arm of the CWRC. • As the model worked very well for the JRB, the BOH would like to know if it would also give valuable results in other sub basins. However, it will not be possible for BOH to use the model in other sub-basins without a number of authorization codes provided by HYDRIQUE.

	• BOH also offers technical support (hydrological forecasts) for multipurpose reservoir management for the whole Changjiang river (29 major reservoirs including the Three Gorges dam). To our understanding, the RS model also allows for reservoir management (reservoir management module) but is not used for this purpose yet. • For the second phase, BOH would like the model to be used in the JRB for finer time and spatial resolutions. Output 1.6: Water supply and demand in Lijiang • A very good and useful work has been achieved in terms of data collection and estimation of water needs. • A Water Evaluation and Planning Model (WEAP) was successfully developed to analyse the water balance and estimate future trends on water demand. This model has been combined with the Routing System RS Model to simulate rainfall-runoff. • The Lijiang Water Bureau has been using the results of this project as a reference for the construction of hydraulic infrastructure. • The fact that the local stakeholders could not be sufficiently involved in the project design has been an issue, which should be taken care of for the second phase.
Assessment of the quality of Outcome 2: Impacts of climate change	Outputs 2.1 to 2.2: Climate change scenarios and models • These outputs are very fundamental for the whole project as they are expected to provide a sound foundation for the analysis of impacts and the definition of adaptive measures and strategies. • The work has been based on the outputs of Global climate models (GCMs) which are models used for understanding the climate change and assessing climate change impacts on various sectors. • For those who are less familiar with climate modelling, the reports should emphasize more clearly that GCMs have not driven by research team, since these models are extremely complex and cannot be used in the scope of such a project. Only widely available climate model outputs have been downloaded, used, compared and downscaled. • Considering the use of three different criteria to select climate models is comprehensive and appropriate. • The selection of only two greenhouse gas emission scenarios RCP 8.5 and 4.5 (out of 4 scenarios) seems not sufficient. The argument of “considering three or four scenarios is too time consuming and not constructive” seems not judged. • The report mentions that a temperature rise of 3-5°C is expected in the far future on the basis of scenario RCP 8.5. However, the uncertainty of this conclusion seems not reliable considering the historical evolution of temperature in the past, especially taking into account the fact that the low emission scenario RCP 2.6 was not included. Based on the recent knowledge in climate science, it seems that the probability of RCP 8.5 is low and that more consideration should also be given to the lower-case scenario RCP 4.5 and RCP 2.6. This conclusion reduces the confidence in the projections.

	• This analysis may have serious consequences on investment planning and policy making and should thus be used with a lot of caution and based on the latest up-to-date climate science knowledge about emission scenarios, taking also into account the SSP (Shared Socio-economic Pathways). The latest climate science knowledge should be incorporated along with the discussion of current results. • More significant and reliable conclusions were expected but the fact that historical data and projections based on various models have been analysed, compared and extensively debated by both parties is a valuable result in itself, even if the conclusion is that there remains a lot of inconsistency and uncertainty. This demonstrates that the magnitude of climate change is not at all clear yet and that more research is needed in cooperation with the best climate scientists and centres, not only in China but also in Europe. • The relative weight of impacts of climate change and of socio-economic development is a key challenge. In China, it is expected that the impacts of socio-economic development, especially the hydraulic engineering constructions, are significantly higher than the impacts of climate change on hydrology. But it is also recognized that the climate change impacts need to be taking into account in infrastructure design, risk management, basin planning and water policy making. Addressing impacts of socio-economic development would require complex socio-economic modelling. Output 2.3 – 2.7: Impacts of climate change • These outputs were released late. • A traditional approach was used in this regard by driving hydrological models using climate projections. • A good job was done by comparing the performances of two hydrological models. • A basic analysis of climate change impacts on the hydrological regimes was carried out. • The team used appropriate tools and methods to assess the climate change impacts on runoff, water supply and demand, hydrological extremes and fish ecosystem. • All the requested work seems to have been achieved satisfactorily. • A 2D hydrodynamic model and fish habitat models have been developed in a pilot area and significant conclusions have been drawn for spawning time periods. • Impacts of hydropower dams on fish could not be analysed due to lack of data before dam construction. • A water temperature simulation model has been developed but not transferred yet to the Chinese partner, who needs more training. • Output 2.7 is only a combination of all impacts. • As the projection of possible impacts on the long term are very important, an uncertainty analysis of the possible impacts will need further work.

Assessment of the quality of Outcome 3: Adaptation strategies and measures	Output 3.1: Study on international experiences • The quality of the report is good. • A lot of work has been done in terms of review existing measures and adaptation strategies in China, Switzerland and other countries. • However, since output 1.1 has shown a lot of uncertainty or even no trend in the frequency of extreme events, it would have been useful to focus more on this essential issue and compare with results in other parts of the world. Output 3.2: Adaptation strategies for water supply and demand in Lijiang • The weakness of achievements of outputs 3.2 to 3.4 has already been mentioned and discussed above. • For the Lijiang area, useful work has been done in terms of data collection, analysis of planned measures, methods and models but still more work seems needed to validate the results. • Emergency management of floods and droughts should also be considered. • It would be important to combine the results with the implementation of the Three Red Lines of Strict Water Resources Management. • As the Water Bureau is starting soon the development of an Integrated Water Resources Management Plan, it is recommended that this activity would be considered for the second phase. • Institutional and legislative suggestions should also be considered in a next phase. Output 3.3: Adaptation strategies for Flood Management and Drought Relief • The weakness of achievements of outputs 3.2 to 3.4 has already been mentioned and discussed above. • This work at local scale has been achieved through close cooperation with CISPDR, who is in charge of technical support for flood and drought control planning, including the development of specific dam operation plans. However, it appeared no easy to influence existing approaches and designs. But the dialogue was certainly very useful and generated more interest for non-engineering measures. • While the BOH is focusing only on real time flood forecasting (input of reservoirs) and not planning, the CISPDR has its own models, not related to the Swiss RS model. A description and comparison of the existing models and how they are used for supporting planning would have been useful. • The CISPDR works under the directives of the overall master plan with a strong focus on the building of reservoirs for flood prevention while the Swiss team has promoted adaptive non-engineering measures. As the master plans principles have already been decided this appeared to be a challenge. • Until now, the design of infrastructure (reservoirs) is based on the use of time series and not on the use of long term forecasts. The uncertainty of the climate change projections based on the use of GCM outputs and the inconsistencies with

	observed historical data is challenging. Further validation of the projected changes will thus be needed as without more confidence in GCMs, "we have nowhere to go". • For drought control, climate adaptation measures have been analysed and discussed for three projects: the Central Yunnan Diversion Project, the Xiangjiaba dam irrigation district project, and the Panzhihua water supply. Cost-benefit analysis has been achieved for several measures and recommendations have been made. • For flood control, the case of Yibin City has been selected, but only in a later stage. This city – the biggest city in the JRB - is very characteristic for flood control. Rather limited work has been achieved by the project at this level. Significant measures were already recommended by the CISPDR, namely to upgrade by a factor of 3 the storage capacity of the reservoirs and to enlarge the dikes and embankments. While CISPDR and the Swiss partner extensively discussed these measures which are not really the direct result of the project. • From several drought management measures, 8 main non-engineering measures have been identified as high priority. • Let us mention here that according to CISPDR, the impacts of socio-economic development account for more than 80% while the impacts of climate change account for less than 20%. It is thus a difficult challenge to consider climate change impacts in relation to impacts of socio-economic development. • It is however believed that the project helped CISPDR to take more into account the possible impacts of climate change, to further fine-tune and review the existing plans, to adopt a more inter-sectorial approach, and to be more open to non-engineering measures. In this way, the project has helped to some extent the CISPDR in better advising the Flood and Drought Control Office (administrative and policy arm of CWRC) in charge of decision-making. Output 3.4: Integration of the strategies/ measures synthesis • Output 3.4 was only a combination of 3.2 and 3.3. • This part of the work is below expectation. The team did not sufficiently analyse how the different sectors would evolve over time due to climate change. However, this is not so easy as medium terms climate models do not predict big impacts and socio-economic impacts (not part of the study) are more significant. • The team delivered a theoretical analysis on how to integrate adaptation measures but faced the difficulty of integrating concretely the measures into planning processes. • The strategic recommendations remain quite general.
Assessment of the quality of Outcome 4: International platform for knowledge exchange. And how effective was communication?	• A lot of efforts have been devoted to internal and external communication. • There has been a lot of interactions, trainings and exchanges. • Through several trainings in Switzerland and exchanges with Swiss experts in China, more than 40 Chinese experts and technicians strengthened their capabilities on different levels. • The project Website is user-friendly. However, some information needs to be updated. • All project documents are available on the Jinsha Share web-platform .

	• The project appears as puzzle or patchwork of outputs with some lack of coherence. This communication issue is mainly the result of how the project has initially been set up and designed. • The expected logic would be to first work on the evidence of climate change, then to identify existing and future climate change impacts, and finally to take these impacts into account in real time decision making and long term planning and policy making. • However, as different time scales and geographical scales are mixed (real time flood forecasting at the basin scale, water allocation at the urban scale, equipment for long-term scientific study of snow/glacier melting, study on fish ecology, etc.) It appeared quite difficult for the team to communicate a clear and coherent vision about the project goal and achievements. • With different formulation of the specific objective and another organization of the outputs it would probably have been easier. • Communication between the partners faced the language barrier as well as the fact that no permanent Swiss staff was affected in Wuhan. • As mentioned under outcome 4, a lot of effort has been delivered in the production of several communication products (videos, websites, factsheets, brochures, workshops, conferences, study tours, trainings, etc.). This has contributed to a lot of knowledge transfer and very useful exchange between Swiss and Chinese partners.
To what extent does the project contribute to poverty reduction, inclusion/and or reduction of vulnerabilities?	• One may reasonably expect that by strengthening the water resources management capacity of the CWRC and of Lijiang city, the project contributes indirectly on the longer term to poverty reduction, inclusion/and or reduction of vulnerabilities to floods and droughts, through more effective and more sustainable approaches.
To what extent do the outcome achieved contribute to improved governance from a system perspective?	• The project is considered by the Chinese partners as a first phase with a strong expectation for a second phase in a stepwise approach towards more efficient and more integrated water and risk management taking into account climate change in the Changjiang River Basin. • The project contributed significantly to the integrated water management and forecasting system of CWRC through improving modelling tools, promoting a more integrated approach and promoting the taking into account of climate change impacts on runoff, droughts, floods, ecosystems, etc. in the planning and design processes. • No contribution yet to the integrated water resources management plan of the basin because of the revision process.
To what extent the outcomes achieved contribute to gender-specific results?	• No special attention has been given to this issue.

Impacts of the use of the results	

Use of the results by the CWRC, the City of Lijiang and the NIEER	• The project has quite significant impacts/influence in terms of:
	  o Increased awareness, knowledge and dialogue about climate change and its impacts on the water regime and on aquatic ecosystems;
	  o Increased interest for non-engineering measures;
	  o Increased interest for a more integrated approach, cross-sectorial cooperation and how combine the different types of measures can be combined;
	  o Improved flood forecasting;
	  o Improved glacier monitoring;
	• The development of the hydro-meteorological forecasting model appears to be already very useful at operational level in CWRC and influences the operation of reservoirs. The results provide a reference and a decision basis for CWRC to command reservoir operation, and thus enhancing the runoff prediction and flood prevention management capacity of the CWRC.
	• There has however been no real direct contact with the end-users of the forecasts. BOH is making the forecasts and provides information to the Flood and Drought Control Office. The project dealt more with the production of the forecast information than with the use of this information. End-users have access to the information through a website (not public).
	• The project was not directly targeting the local people living in the project area. However, some results are already useful at local level such as the WEAP model for the City of Lijiang, allowing better water allocation. The project results constitute and important basis for more comprehensive water resources management and planning. The city of Lijiang plays also a key role as *pilot city*.
	• The state-of-the-art glacier monitoring station is very relevant for research and longer term scientific analysis. It is useful for better prediction of the changes in the river flow at the river source, which is the result of snow/glacier melting and melding of frozen soil.
	• The study of impacts on aquatic ecosystems has also produced very useful results which will impact the design and operation of hydropower dams.
	• Tangible impact on CWRC's basin planning and policy making is not yet visible due to the revision timeframe of the master plan as already explained in the section on relevance (revision every 10 to 15 years). However, the project is definitely on the right track to feed into planning and policy-making on the longer term.
	• It is mainly through the relation (workflow) between the CISPDR (and also to some extend the BOH, the CRSRI and the IHE) and the Flood and Drought Control Centre (administrative arm) that the project results can influence the decision-making and policy level.
	• Seen the remaining uncertainties regarding climate change impacts, the results will still have to be validated by various departments of the MWR before they can be taken into account in the revision of the master plan. The fact that no clear

	evidence of changes in the frequency of extreme events have been detected in the historical data and the fact that the results of GCM outputs are very divergent, limit to some extent the impact of the project. Further scientific work on the evidence of past and future climate change, using the expertise of high-level climate scientists in China and Europe is required. However, the methods and approaches of the project constitute a *valuable reference* for analysing in a more integrated and systematic way the impacts of climate change on water security, including better protection of aquatic ecosystems. • The work on output 3.3 with the CISPDR has helped to better take into account climate change impacts in an approach which could be extended to the whole basin. Indeed, according to CISPDR, the JRB project is considered as a pilot experience which will be rolled out to the entire basin. This is a valuable methodological improvement. • JRB is also demonstrative pilot for *other rivers* having their source in the Qinghai-Tibetan plateau. • It is still not so sure if the registration platform of extreme events will really be used on the longer term for the JRB and outside JRB. • The project is well aligned with the current Chinese needs in terms of water conservation and management and flood and drought control. However, the work should be connected to the "Three Red Lines for Water Resources Management" which provide very strict criteria and puts a lot of pressure on the local authorities.
Use of the results by the local stakeholders: to what extent has the project been able or will be able to meet the priority needs and demands of the people of the JRB	• This could not be evaluated directly as the project has been designed to meet the needs of the people through the CWRC • The local population will certainly benefit from better flood forecasting in the basin and better water allocation in Lijiang. • The work done at Yibin has not been done directly with the Yibin stakeholders but through discussions with CISPDR. There has probably be no impact yet as the planned measures (increasing the volume of reservoirs etc.) were already defined before.
Use of the results beyond the River basin	• Not yet
Benefit for the cooperation between Switzerland and China	• This project has largely contributed to the excellency of the relations at high level. • The cooperation with the Ministry of Water Resources, not only for this project but also for other projects is outstanding and in a privileged situation.
Benefits on the Swiss side	• The project strengthens the Swiss expertise in glacier monitoring and water management in mountainous regions. The state-of-the-art glacier monitoring station offers high visibility to Switzerland (a panel should be added). • This project consolidates the position of Switzerland as a key player in the Global Debate on Climate Change. The message that Switzerland is contributing to more sustainable management of the Changjiang River, biggest river of China and third longest river in the world, is an important political message.

<table>
<tr><td></td><td>• The project has a positive return for the Swiss companies in terms of image. It is a strong reference.</td></tr>
<tr><td colspan="2">Assessment of efficiency</td></tr>
<tr><td>In terms of cost-benefit ratio: to what extent is the relation between resources (mainly financial and human resources) and time (e.g. delays compared to planning) required and results achieved appropriate (Cost-benefit ratio - CBR).</td><td>• The overall cost-benefit ratio of the project seems more than acceptable but difficult to estimate in such a short time. It was indeed not the requirement for this review mission to analyse (audit) in detail the financial and human resources used for each activity and by each partner. It is therefore not possible to assess in detail the cost-benefit ratio of each output.
• Let us remind that the share between the various outcomes was initially:
<table><tr><td>Component</td><td>Percentage of financial effort</td></tr><tr><td>PIU</td><td>9%</td></tr><tr><td>Outcome 1</td><td>33%</td></tr><tr><td>Outcome 2</td><td>21%</td></tr><tr><td>Outcome 3</td><td>20%</td></tr><tr><td>Outcome 4</td><td>15%</td></tr></table>• From our rough estimation, it seems that outcome 1 was underestimated and that output 2 and 3 have been overestimated.</td></tr>
<tr><td>Cost-efficiency: to what extent the approaches used by the project are considered efficient (Cost-efficiency).</td><td>• Overall the cost-efficiency seems to be acceptable but without detailed evaluation of the expenses it is difficult to provide a more in-depth assessment.
• The language barrier has sometimes been an issue. CWRC is a huge organization and it seems that it was not always easy for the Swiss partners to mobilize and interact with the appropriate human resources.</td></tr>
<tr><td colspan="2">Assessment of sustainability</td></tr>
<tr><td>Sustainability of the outputs: to what extent will the positive results (outputs and outcomes) be continued beyond the end of the external support.
Considering also potential risks in the context?</td><td>• Some remote assistance for flood forecasting with the RS seems still required (maintenance contract)
• The sustainability of the monitoring station is very good but it seems that the data collected are still in Switzerland, stored at GEOPREAVENT. This issue should be addressed and data storage should be in China.
• The extreme events registration platform has not yet been transferred to a server in China and there may be a risk that even if the platform is transferred, the system would not be maintained.
• For the aquatic ecosystems, the use of the water temperature model needs training. Now the Chinese partner has only the simulated results (issue of copyright).</td></tr>
</table>

Sustainability as related to the capacity of the partner organization.	• A lot of training has been achieved, which increases the sustainability. • Some additional training may be required for quality control of the data collected automatically by the flood forecasting system. • For the aquatic ecosystems, the use of the water temperature model needs training. Now the Chinese partner has only the results (issue of copyright).

5 Recommendations for a possible second phase

Recommendation 1: a second phase building on the most successful achievements of the first phase

The first phase contributed significantly to the development of a solid foundation for enhanced water management in the JRB. As the Chinese partners are satisfied with the outcomes, there is a strong expectation for a second phase, building on the achievements so far.

During the various meetings and discussions, the review team received several valuable inputs about possible actions and priorities. The table (Table 3) below presents relevant topics which have been discussed during the mission.

Table 3: relevant topics for phase II

Topic	Activity
Further development of the real-time flood forecasting and risk management framework	• Application of the model and methods in the JRB and in pilot cities at finer temporal and spatial scales (higher resolution) for local risk management such as flash floods and mountain torrents resulting from rainstorms. Other natural hazards to be considered are droughts, landslides, debris flow and avalanches. • Looking also at new advanced technologies (artificial intelligence, smart water grid, etc.). Comparison with other existing models. • Application in other sub-basins of the Changjiang river basin • Use for multipurpose reservoir management: CISPDR would be interested in combining the BOH model with their own reservoir operation model. An important input to be further identified would be how to include environmental flows in coordinated multipurpose dam operation. • More research is needed to identify how can the various reservoirs in the JRB (two major reservoirs) can play a bigger role in CCA, not only for flood control but also for drought relief, conservation of ecosystems, water supply, hydropower generation. • Defining the eco-environmental flows at key river sections in the mainstream and in key tributaries in JRB. • Urban flood risk management for Yibin City, following “Sponge City” concept and integrated flood risk standards, hazard and risk mapping, etc.). • Outreach to other River Basin Commissions inside and outside China. Belt and Road and Changjiang River Economic Belt program, etc.
Glacier monitoring and snowmelt modelling	• Further work on monitoring of glaciers and snow-melting in the upper reach of JRB. • Expand Monitoring of glaciers in the Qinghai–Tibet plateau, source of several Chinese rivers. • Identify how remote sensing could be useful to integrate a module in the Flood Forecasting model. However, the contribution of snow/glacier melting to the flow of the Changjiang is very small and the usefulness would mainly be at the local scale, namely in relation to aquatic ecosystems.

Evidence of climate change and climate change impacts relating to extreme events	• Further validation of the projected medium and long term changes. • More in-depth study of the frequency of extreme events (droughts and floods) based on more historical data. Further work should be based not only on the knowledge in the JRB and in China but also on the most state-of-the art international knowledge. Involvement of renowned international scientists for the European Climate Centre, etc. • It is recommended to involve the Climate Meteorological Administration (CMA). CWRC has a MOU with this organization.
Further work on aquatic ecosystems in relation to climate change and operation of hydropower dams	• Adding an output on adaptation measures for aquatic ecosystems. This was not included in the first phase. • Contribution to defining operational rules of hydropower plants considering ecosystem protection and climate change. • Overall plan for fish restauration and protection in rivers and lakes. Green hydropower certification (including lessons learned from the Swiss experience).
Supporting planning and design taking into account climate change	• Integrated Water Resources Management and Climate Change Adaptation Plan for the city of Lijiang, including institutional and legal measures. This would be as a valuable demonstrative pilot for other cities. • Water Allocation Plan for different towns in Lijiang City, and possibly other cities in JRB affected more severely by climate change. • Improving design standards: planning and design of infrastructure is based on the use of standards. In China, the technical standards do not consider CC which, together with land use changes has impacts on the hydrological processes (discharge and return period of extreme events). Further work could thus look into how climate change considerations would allow to modify the standards. • Contribute to the achievement of the Three Red Lines for Water Resources Management.
International platform	• Continuation of the activities of the first phase: website, study tours, workshops, trainings, communication products, etc. • Promote the results towards the “Belt and Road” and the “Yangtze River Economic Belt” programmes.

Recommendation 2: put the necessary efforts in a comprehensive demand-driven project identification and preparation

The preparation of the second phase needs further consultations with the key stakeholders in a very open demand-driven approach, taking into account both the priority needs of China and the strategic objectives of the Swiss Global Programme Climate Change and Environment (GPCCE).

Not only the technical entities should be consulted but also the top management and the administrative and policy making entities of CWRC (i.e. the Flood and Drought Control Office) as well as NIEER of the Chinese Academy of Sciences. For work at more local level (pilot work in urban areas), the local stakeholders should be consulted and involved in the project design from the beginning.

Recommendation 3: continue to work at the technical level with a view of enhancing the foundation for climate change adaptation planning and policy making

As explained in the findings, the planning cycle is a-long term process (10-year revision of the master plan) and the revision of the current plan (2012) will not start in the near future. Therefore, the expected influence can mainly be *indirect* through further helping organizations in enhancing their technical foundations for planning, policy making and operational decisions, taking into account climate change and protection of ecosystems. It is through such kind of technical support that the project would best be able to influence planning and policy-making in the longer term.

Recommendation 4: a more focused second phase highlighting the competitive advantages of the Swiss expertise

The thematic scope of the first phase was very broad. A more focused approach is recommended, highlighting and consolidating the specificities and strengths of the Swiss expertise. Priority should be given to outcomes which meet the demand of the partners and at the same time consolidate the visibility and world leadership of Switzerland in the global climate change debate. In other words: "*what could be during the next phase, the most relevant and coherent set of activities leading to tangible high value-added outputs for improving climate change adaptation in and outside the JRB, based on renowned Swiss expertise".* It is obvious that Switzerland has more renowned expertise in mountainous regions than in flood plains.

The following options should be considered:

- Option 1: A project focusing mainly on Risk Management (Floods and Droughts) and multipurpose reservoir operation in the JRB with possible outreach to other sub-basins. The work done in phase 1 would be further enhanced at smaller temporal and spatial scales and also tested in other sub-basins. The hydrological modelling would also be improved/refined so as to include mid-long-term hydrological predictions based on mid-long-term prediction of precipitation. The work in the JRB would serve as a reference to be outreached to other areas or sub-basins and even outside the Changjiang Basin. Coordinated multipurpose reservoir management in the whole basin, including up to 48 major reservoirs in the future, is one of the key challenges of the CWRC. However, it is not sure that this project can reasonably contribute to such an ambitious goal in a 3-year period. For this option, it is recommended to involve more strongly the CISPDR and the Flood Control and Drought Control Office, part of the administrative and policy arm of CWRC, in charge of decision-making.
- Option 2: A more scientific project focusing on longer-term glacier monitoring and modelling in the upper reach of the JRB or more widely in the Qinghai-Tibetan plateau. This could be combined with work on aquatic ecosystems and on risk management (mountain torrents, landslides, etc.). If extended to the Qinghai-Tibetan plateau, this option would meet the demand and offer high visibility to Switzerland. The outcome would mainly be an increased capacity of China for monitoring, analysis and modelling of the melting of glaciers, snow and permafrost, to generate important knowledge for the management of several major rivers. A cooperation with ICIMOD could be considered.
- Option 3: Further work on generating more reliable evidence of climate change and climate change impacts in the basin. This would require stronger involvement of climate scientists in China and in Europe. This would be relevant both for China and for the GPPCE, However, in such a short time, it would probably not generate much more tangible results than in the first phase. High uncertainty would most probably remain.
- Option 4: Combination of option 1 and 2 in a project with two components, but keeping in mind that the contribution of glacier/snow melting to the river flow and floods of the Changjiang is very small.

Recommendation 5: formulate only one specific and more straightforward objective

To avoid the same communication issues as during the first phase it is highly recommended to formulate only one tangible, SMART, striking and straightforward specific objective (main expected outcome).

6 Annexes

Annex 1: Detailed expected list of outputs and deliverables (Logical Framework)

Output	• **Indicators/deliverables**
1.1 Extreme events analysed	• Database (register of events) established and a test-set visualized on maps (e.g. Web-GIS) • Extreme natural hazard events analysed in terms of frequency, intensity and location
1.2 50 years of hydro-meteorological data	• Systematic summary of 50-year hydro- metrological data • Characteristics of the data analysed and elaborated
1.3 Yulong Snow Mountain Monitoring System Operational	• Terrestrial Glacier Monitoring Station at Yulong Snow Mountain (Current monitoring network is analysed; Monitoring capacity of Yulong Snow mountain is enhanced with added automatic monitoring devices) • Snowmelt runoff simulation based on Satellite data: o Existing satellite monitoring technologies are evaluated in terms of feasibility and available resources; o Demo version of the satellite monitoring system implemented and operational;
1.4 Overview of Aquatic Ecosystem	• Data of aquatic species diversity, population and distribution of key species etc. are collected and analysed
1.5 Hydro-meteorological forecasting model	• Short-mid-long term hydro- meteorological forecasting models are introduced and tested. • Forecasting system is further developed and operational.
1.6 Current Water Supply and Demand Situation	• Information on demand from agriculture, industry and human settlements and water supply of reservoir and pumping stations are collected. • Water Allocation Model is set-up and calibrated.
2.1 Suitable GCM and IPCC emission scenarios identified and selected	• Available GCMs evaluated. • Suitable subset of GCMs selected based on the purpose and regional characteristics • Of the 4 available IPCC emission scenarios the appropriate number and scenario range selected, depending on the uncertainty analysis • Appropriate downscaling method selected.
2.2 Climate Scenarios for the JRB	• Output of selected ensemble of climate models and emission scenarios downscaled to study areas.
2.3 Hydrological simulations with climate change scenarios	• Record of model evaluation and adjustment discussions within Output group • Impact model adjusted for application in study areas is ready including defined parameters and methodology of impact analysis • Format for description of impacts and prioritization prepared
2.4 Impacts on runoff, hydropower and water balance	• Description of impacts of climate change on runoff and water supply, with uncertainty analysis • Expert discussions executed
2.5 Impacts on flood and drought occurrence	• Description of impacts of climate change on flood and drought occurrence, with uncertainty analysis • Expert discussions executed
2.6 Impacts on aquatic ecosystems	• Description of impacts of climate change on ecosystems, with uncertainty analysis • Expert discussions executed, e.g. on Habitat fitness model or population viability analysis of key species under the different hydrological scenarios
2.7 Impacts on stakeholders	• Description of impacts of climate change on stakeholders • Prioritization (low, medium, high) of the impacts regarding vulnerability and adaptability (existing possibilities of stakeholders to adapt) • Stakeholder workshop has taken place
3.1 International experiences from Adaptation to Climate	• Record of discussions within Output groups on climate change adaptations in mountainous regions; • Number of experiences (e.g. based on reports) analysed and made available;

Change in River Basins	• International conferences organized or participated; • knowledge sharing products produced; • Report on existing international experiences; • Translated report on experiences in water resources management, and possibly governance in the context of changing climate
3.2 Adaptation Strategies and Measures for Water Supply and Demand	• Adaptation measures on water supply are identified and assessed in consultation with experts and stakeholders;
3.3 Adaptation Strategies and Measures for Flood Management and Drought Relief	• Adaptation measures on flood management and drought relief are identified and assessed in consultation with experts and stakeholders;
3.4 Documentation of Adaptation Approach and Methods for Assessing Adaptation Measures	• Methodology for assessment of adaptation strategies and measures (including assessment of risk reduction etc.) • Integrated adaptation strategies and measures have been developed and assessed. • Suitable integrated adaption strategies and measures are proposed;
4.1 Sino-Swiss Conferences	• Conferences and workshops are organized; • Number of participants to conferences and workshops; • Updated annual workplans;
4.2 International conferences and workshop	• International conferences and workshops are organized; • Number of participants to conferences and workshops; • Presentation of JRB project in international conferences; • Knowledge sharing products are produced;
4.3 Publications	• Technical papers and publications sub- mitted; • Communication products for SDC, CWRC/MWR and other stakeholders are produced;
4.4 International platform	• Project communication platforms developed and used by project team; • Field surveys conducted in JRB;

Annex 2: meetings and participants

#	Attendee	Title and Agency
External Experts		
1	Olivier COGELS	Freelance River Basin Management and Water Diplomacy Expert; Professor Emeritus, Catholic University of Louvain, Belgium.
2	Yangwen JIA	Professor, China Institute of Water Resources and Hydropower Research(IWHR)
3	Jie CHEN	Professor, Wuhan University
Project Team		
Day 1 am, meeting with BICST and CRSRI		
1	Jing GUAN	Deputy Director General, BICST , CWRC, PIU member
2	Zhulin ZHOU	Deputy Division Chief, BICST ,CWRC, , PIU member
3	Jijun XU	Division Chief of water resources department, CRSRI, JRB Project Leader
4	Deng PAN	Senior engineer, CRSRI
5	Xiaofeng HONG	Senior engineer, CRSRI
6	Yuru LIN	Engineer, CRSRI
7	Zhe YUAN	Engineer, CRSRI
Day 1 pm, meeting with BOH		
1	Wenfa YANG	Deputy division chief of forecasting department, BOH
2	Jun ZHANG	Senior engineer of forecasting department, BOH
3	Jin ZHANG	Senior engineer of forecasting department, BOH
4	Yubin CHEN	BOH, senior engineer

Day 2 am, meeting with CISPDR		
1	Huabin GAO	Deputy division chief of planning department, CISPDR
2	Lin ZHANG	Deputy chief engineer of planning department, CISPDR
3	Xiaochong HE	Senior Engineer, CISPDR
4	Lina HOU	Engineer, CISPDR
5	Linzhi YAN	Engineer, CISPDR
6	Zhulin ZHOU	Deputy Division Chief, BICST ,CWRC, , PIU member
Day 2 pm, meeting with IHE		
1	Xiaojuan CHEN	Deputy department head, IHE, CWRC
2	Peng ZHANG	Associate professor, IHE, CWRC
3	Zhi YANG	Associate professor, IHE, CWRC
Day 4 am, field visit to Yulong snow mountain		
1	Yuanqing HE	Professor, NIEER
2	Xingguo YAN	Master student, NIEER
3	Jing GUAN	Deputy Director General, BICST , CWRC, PIU member
4	Zhulin ZHOU	Deputy Division Chief, BICST ,CWRC, , PIU member

5	Deng PAN	Senior engineer, CRSRI
Day 4 pm, meeting with Lijiang water authority		
1	Jimu LI	Division chief, water resources management department, Bureau of Lijiang water resources
2	Jing GUAN	Deputy Director General, BICST , CWRC, PIU member
3	Zhulin ZHOU	Deputy Division Chief, BICST ,CWRC, , PIU member
4	Jijun XU	Division Chief of water resources department, CRSRI, JRB Project Leader
5	Deng PAN	Senior engineer, CRSRI
6	Junjun HUO	Senior engineer, CRSRI
7	Bin XU	Senior engineer, CRSRI

Debriefing Meeting, 29 January 2018

#	Attendee	Title and Agency
External Experts		
1	Olivier COGELS	Freelance River Basin Management and Water Diplomacy Expert; Professor Emeritus, Catholic University of Louvain, Belgium.
2	Yangwen JIA	Professor, China Institute of Water Resources and Hydropower Research(IWHR)
3	Jie CHEN	Professor, Wuhan University
Swiss Embassy		

4	Felix FELLMANN	Counsellor, Head of Division, International Cooperation Division (ICD)
5	Liyan WANG	Senior Climate Change and Environment Advisor, ICD
6	Justine ANKEN	Program Officer, ICD
7	Yuying FENG	Program Assistant
8	Jie BAI	Finance Officer
Ministry of Water Resources		
9	Jingjun PENG	Deputy Head of Division, Department of International Cooperation and Technology
BICST and CRSRI		
10	Jin CHEN	Vice President of CRSRI, PLU Member
11	Jing GUAN	Deputy Director General, BICST, CWRC, PLU member
12	Zhulin ZHOU	Deputy Division Chief, BICST, CWRC, PLU member
13	Jijun XU	Division Chief of Water Resources Departemnt, CRSRI, JRB Project Leader
14	Deng PAN	Senior engineer, CRSRI
Chinese Academy of International Trade and Economic Cooperation (CAITEC)		
15	Xiaoning CHEN	Assistant Research Fellow, Institute of International Development Cooperation, CAITEC, Ministry of Commerce

Annex 3: detailed questionnaire

1 Relevance

1.1 To what extent are the objectives consistent with the demands and the needs of partner country and with their sector policies and strategies

1.1.1 Was the consultation of the Chinese partners (CWRC and MWR) sufficient during project preparation?

1.1.2 What are the main (most important) initial main expectations – objectives? What was the main issue we wanted to address?

1.1.3 Are the project objectives consistent with the overall national water sector strategy and policy of China and still relevant in the current political and socio-economic context?

1.1.4 Is the project in line with China's national river basin management strategy ad policy?

1.1.5 Are the project objectives relevant in terms of knowledge sharing for other river basins in China?

1.1.6 What operational management needs of CWRC does the project contribute to within its mandate?

1.2 To what extent are the objectives of the project consistent with the demands and the needs of the local target groups (incl. gender-specific requirements)

1.2.1 Were the target groups sufficiently well identified and have their priority needs/demands been correctly assessed?

1.2.2 Are there other target groups and/or priority needs which should be taken into account in a possible second phase?

1.3 To what extent is the project design (project structure) adequate to achieve the goal and objectives in terms of choice of approach and operational elements, articulation of components, choice of partners, and consistency with SDC policies and experiences.

1.3.1 How much were you personally involved in the design and planning of the project?

1.3.2 Were the partners sufficiently involved in the project preparation and has there been a proper assessment of their roles, capacities, and resources?

1.3.3 For each component and output was the choice of the partners adequate and relevant to attain the various outcomes/outputs? Are there other partners which you would have recommended?

1.3.4 Is the initial Logframe still appropriate?

1.3.5 What was the degree of relevance of each outcome and output (see table)?

1.4 Is the project consistent with SDC's policies and experiences?

2 Effectiveness

2.1 Progress of achievements of outcomes: to what extent have the planned objectives at outcome level been achieved, taking into account their relative importance

2.1.1 Have the expectations of all parties been met?

2.1.2 Have all promised outcomes been 100% delivered?

- Knowledge of water dynamics and forecasting
- Impacts of climate change on water supply and extreme events
- Adapation strategies and measures

- International platform for knowledge exchange

2.1.3 Which outputs/deliverables are considered as already fully operational and which outputs/deliverables need more work/effort than was initially estimated and what is the main reason or obstacle encountered?

2.2 Effectiveness in terms of water governance from a system perspective

2.2.1 How do think the outputs contribute effectively to improved water governance at the basin level and did the project significantly increase integration and information sharing among the various sectors involved?

2.2.2 How do think the outputs contribute effectively to improved water governance at Municipality level

2.3 Quality of the achievements of each output: critically assess the quality of each output/deliverable

2.3.1 Output 1.1

- What is the conclusion based on the observed data? No trend or no conclusion?
- Why did you not analyse other datasets for more than 50 years?
- What are the trends in China?
- Did you used the most state-of-the art techniques for statistical analysis of extreme events, Which methods?
- How much have Chinese climate scientists be involved?

2.3.2 Output 1.2: reference situation

2.3.3 Output 1.3 Monitoring station:

- quality and maintenance needs of the monitoring station if GEOTEST and GEOPRAVENT is not involved?
- representatives of only one station for observing the changes of glaciers and snow cover in such a big area. To what extent can the data and conclusions be generalized?
- Remote sensing: What is the interest and capacity of the Chinese partner
- Will the methodology be used?

2.3.4 Output 1.4

- Why couldn't we work on aquatic ecosystems instead of only on fish ecology ?

2.3.5 Output 1.5: Forecasting model

- how operational is the model and is there still an issue with the data quality which could lead to bad forecasts or no output?
- `How can we use the forecasting model for management of reservoirs?

2.3.6 1.6: Output Water supply and demand

- What have been the respective roles of the partners how do you qualify the cooperation with local authorities?
- Water supply study: Will such detailed monitoring continue without the support of the project?

2.3.7 Output 2.1 to 2.2: Climate change scenarios and models

- What have been the respective roles of the partners how do you qualify the cooperation?
- How did you select the scenarios?

- How did you select the GCM models? Did you calibrate the models with historical data ? Did you try to fit calculated precipitation and temperature from GCMs models with historical data and what are the conclusions about the models?
- How much have Chinese climate scientists been involved in this climate modelling and is this state-of-the art?
- Can we reduce the uncertainty and how?
- Opinion/comments about the reliability/quality of these models and can we (who?) do better with these models if we work more on historical data in china ?

2.3.8 Output 2.3: Hydrological simulations

- What is the reliability of the hydrological simulations with the climate change scenarios?
- What can we do with such a high level of uncertainty? What are the policy implications?

2.3.9 Output 2.4 – 2.6: Impacts

- What have been the respective roles of the partners for analysing the impacts and how do you qualify the cooperation?
- Did the project succeed in finding out how climate change will affect the various sectors?
- What are the main impacts (quantitative) in each sector and what are the consequences in terms of climate change adaptation?
- Do the results of the impact studies lead to better water allocation?

2.3.10 Output 3.1: International experiences

- What was the usefulness of the study on international experiences and who uses these results?

2.3.11 Output 3.2 – 3.3: Adaptation strategies for water supply/demand, flood management and drought relief

- What have been the respective roles of the partners how do you qualify the cooperation?
- Did the project study the existing policies and strategies as well as the ongoing planning processes and tried to contribute to them?
- Seen the uncertainties and reliability issues related to the projections of Climate Change Models, how reliable and robust are your strategic recommendations, for example to increase by a factor of 3 the current storage capacity of the two reservoirs Xiangijaba and Xiluodo?
- It is mentioned in the reports that a River Basin Management Plan is recommended as a basis for decision-making with respect to investments or action plans. To what extent did the project work on a basin development strategy and basin investment program for the JRB?

2.3.12 Output 3.4: Integration of the strategies

2.3.13 To what extent have the strategies been integrated?

2.3.14 Outcome 4: what is the quality of the international platform for knowledge exchange?

2.4 Effectiveness in terms of gender mainstreaming

2.4.1 To what extent have the outcomes achieved contribute to gender-specific results?

2.5 Effectiveness of communication

2.5.1 Critically assess project communication and knowledge management in terms of quality of knowledge products, publications, outreach of project website and social media

3 Efficiency

3.1 In terms of cost-benefit ratio: to what extent is the relation between resources (mainly financial and human resources) and time (e.g. delays compared to planning) required and results achieved appropriate (Cost-benefit ratio - CBR).

3.1.1 is your opinion about the organisational structure (management structures)?

3.1.2 In terms of implementation and production of the deliverables, was the project working with the best arrangement of partners? How was the cooperation between the Chinese and Swiss teams?

3.1.3 What is your opinion on the co-management/interaction/communication between you and the Chinese counterparts.

3.1.4 How do you assess, critically, the performance and the capacity of the partners and have the partners played a constructive and supportive role for the project implementation and allocated enough human resources time to the production of the outputs/deliverables?

3.1.5 Please comment on the level of know-how transfer that has been achieved

3.1.6 Data issue: the availability, quality, and uncertainty has been a serious concern. Please comment.

3.1.7 In case the data availability or data accuracy remain a problem (for instance reservoir data), to what extent has this threatened the fulfilment of the project and the reliability and operationally of the models?

3.2 Cost-efficiency: to what extent the approaches used by the project are considered efficient (Cost-efficiency).

3.2.1 Have the resources allocated to each activity been defined appropriately defined to attain the expected outputs and deliverables? In the table of outputs given in annex, please indicate the which output resources have been significantly underestimated if any.

3.2.2 Do you think that the objectives have been achieved in a cost-effective way? What could have been more cost-effective?

4 Sustainability

4.1 Sustainability of the outputs: to what extent will the positive results (outputs and outcomes) be continued beyond the end of the external support. Considering also potential risks in the context?

4.1.1 To what extent was technical and institutional know-how transfer achieved? Will the Chinese partners in the future still rely on technical expertise from Swiss partners to implement the findings of the project or to expand its focus to other river basins?

4.1.2 What actions are still most urgently needed (gaps) to establish very solid results in order to further enhance integrated water resources and risk management?

4.1.3 What is further required to ensure the sustainability of the models? In the reports it is stated that for the future, it is necessary that BOH experts integrate the simulation model maintenance within their daily tasks, focusing on the detailed database control. This is mainly due to the high quantity of real-time data and the complexity of the data transfer processes, which lead to lower data quality standards than in other similar systems developed in Europe. With a close system control and maintenance, a strong added value will be obtained with such an integrated technology. What is the risk that this will not be achieved?

4.1.4 for the maintenance of the glacier monitoring station it seems that clarification is needed to analyse the workload, budget and responsibilities. SDC requested relevant information shortly. Please comment.

4.2 Sustainability as related to the capacity of the partner organization.

4.2.1 To what extent are the partner organizations capable to carry on activities? Capacity includes technical, financial capacity, human resources and importance of the activity for the organization.

5 Impacts of the use of the results

5.1 Use of the results by CWRC

5.1.1 Did the project improve the management capability for JRB at CWRC, and provide technical support for real time decision-making?

5.1.2 Which outputs/deliverables are already used operationally (or will be used in the short term) by CWRC for the JRB.

5.1.3 In addition to flood management, to what extent the project outputs and deliverables will really influence CWRC's water resources management in terms of drought management, eco-system protection, plans for adaptation measures, both engineering and non-engineering?

5.1.4 Which outputs/deliverables are already used operationally (or will be used in the short term) for other sub basins?

5.1.5 To what extent have the strategies been able to influence plans or decisions?

5.1.6 To what extent will the outcomes of the studies relating to the aquatic ecosystems influence dam design and operation?

5.2 Use of the results by the stakeholders: to what extent has the project been able or will be able to meet the priority needs and demands of the people of the JRB

5.2.1 To what extent will the risks associated with water supply and water pollution be better managed?

5.2.2 To what extent will the project contribute significantly to reduction of vulnerability to droughts. Do you believe that the outputs will really be able to reduce more than 10% of disaster loss, equivalent to more than RMB 100 million?

5.2.3 To what extent will the project results be able to reduce the loss in property and lives?

5.2.4 To what extent will the biodiversity of identified vulnerable ecological zones be better protected and will the stability of the ecosystems be better maintained?

5.2.5 For hydropower, the main issue is the need for optimization of dam operation (42 cascade hydropower stations planned in JRB on the main stream and on Yalong river). Does the project contribute already effectively to an optimization of the operation of the hydropower infrastructure?

5.3 Use of the results beyond the River basin

5.3.1 To what extend the results of the study relating to climate change have already an influence on China's climate change adaptation strategy?

5.3.2 To what extent has this project already an influence on China's water policy?

5.3.3 What results and processes have potential to be shared for operational purposes with other river basins in China?

5.3.4 How will these results of the studies be disseminated and used?

5.3.5 To what extent the project outputs may have impacts beyond China? Is there a potential to feed results into policy-dialogue processes on the regional or global level? See comments of Vice President ZHONG Zhiyu during PSC In Berne on June 22, 2017.

5.4 Benefits on the Swiss side:

5.4.1 To what extent will Switzerland benefit from the experience in terms of awareness building and of strengthening of the know-how on climate change impacts and adaptation in mountainous regions?

5.4.2 Does the project significantly increases the Swiss contribution to Climate Change Adaptation, Disaster Risk Reduction and development in a global context and provide concrete inputs to regional and global policies regarding water resources management, disaster risk reduction, energy production, agriculture, under conditions of climate change.

6 Outlook for future activities

6.1.1 What do you see as pertinent and promising activities/outputs for a potential second phase which would meet priority needs or demands?

6.1.2 What are still the gaps. Do we need to go deeper in some of the outputs?

6.1.3 Do we want to go more into strategic planning and policy making or remain at technical level?

6.1.4 One option could be to further extent the RS to the whole basin (To the Three Gorges and Maybe Shanghai (look at CRSRI)

6.1.5 Shall we contribute to the Climate science for better analysis of historical data and more reliable modelling?

6.1.6 Did we reach to point to be able to propose the methods and models to other basins in China?

6.1.7 Is there a clear demand for integrated risk management?

6.1.8 Is there a demand for support at policy level or only at technical level?

6.1.9 Link with the National Reference and Development Commission DNRC in terms of Climate Change Adaptation Policy?

6.1.10 Please comment the following list of proposed activities

1	Further strengthen the observational capabilities of meteorological hydrology, glaciers, snow cover and permafrost in JRB to continuously verify the impact of climate change on spatial/temporal trends of water cycle and water resources.
2	Further develop the mechanism of monitoring and early warning system for extreme meteorological and hydrological events (especially flash floods) in JRB.
3	Further develop the IWRM plan and policy on basin level considering climate change.
4	Further promote the application of integrated adaptation plan for urban safety and socio-economic development under climate change.
5	Enhance research on river/lake water resources and aquatic ecosystem protection programs in the context of climate change.
6	Water Allocation Plan for different towns in Lijiang City, and possibly other cities in JRB affected more severely by climate change;
7	Sustainable management of lakes and rivers and water source protection in JRB, considering water resources, ecosystems, soil erosion (incl. sediment transport), landslides etc.;

8	Urban flood risk management for Yibin City, following “Sponge City” concept and integrated flood risk standards (flood risk cycle, hazard and risk mapping, risk-based measure planning applying cost-efficiency-analysis, coping with overload situation etc.);
9	Flash flood forecasting system; Pilot application;
10	Reservoir management (based on short-, mid- and long-term hydro-meteorological forecasting system which has been built in Phase 1); Integrated approach to improve decision making;
11	Glacier, snow cover and permafrost monitoring in upper Jinsha catchment, e.g. assessment of data regarding impacts of climate change (see aspect 1) above);
12	Drought monitoring system for JRB, incl. remote sensing technologies (soil moisture) etc.;
13	Integrated optimization of Dianzhong Water Division Project (Yunnan Province).
14	Make results of JRB Phase 1 visible and available for other cities, regions, basins in China;
15	Demonstrate progress and achievements of JRB next phase projects to stakeholders and decision makers.