

# **Briefing Notes Package**

## **5th RTWG Meeting**

**13-14 August 2015, Siem Reap, Cambodia**

**Document Prepared: 28 July 2015**

This briefing notes package provides the participants a summary of what to expect from the meeting including decisions that are requested to be made. The briefing package includes also a synopsis of the topics and when appropriate stand-alone documents (as attachments) for review.

The objectives of the 5<sup>th</sup> RTWG meeting are the following:

1. Provide and discuss overall progress of the Council Study
2. Provide a progress update on thematic and discipline areas of the Study and solicit RTWG comments and guidance including resolving any issues
3. Discuss overall schedule, next steps, challenges, and proposed corrective actions

The briefing note is organized according to the following agenda topics in line with the meeting objectives listed above:

- Overall Progress Update
- Formulation of Development Scenarios – Overall Approach and Road Map
- Formulation of Development Scenarios Progress Updates
  - Irrigation
  - Agriculture and Land Use Change
  - Hydropower
  - Domestic and Industrial Water Use
  - Flood Protection and Floodplain Infrastructure
  - Navigation
- Progress Update – Hydrologic, Sediment and Water Quality Modelling
- Progress Update – Biological Resources Assessment
- Progress Update – Selection of Climate Change Scenarios for the Council Study
- Progress Update – Scoping Mission for the Socio-Economic and Macro-Economic Assessment
- Overall Implementation Schedule and Next Steps

## Agenda Topic - Overall Progress Update

### What to Expect

A brief background and important progress milestones of the Council Study will be presented to put the 5<sup>th</sup> RTWG meeting in context. Most of the **participants are expected to be familiar and knowledgeable** of the Council Study objectives and overall approach as per documented in the Council Study Concept Note, Terms of Reference, and Inception Report (version 27 October 2014) and are **expected to provide continuous and consistent guidance to the Council Study Team**. These documents and related information are available in the Council Study Web Site (<http://www.mrcmekong.org/highlights/>).

### Synopsis

The implementation phase of the Council Study officially began when the Member Countries agreed during the 3<sup>rd</sup> RTWG Meeting on 14 November 2014 to use the Inception Report (version 27 October 2014) to be the basis of the Council Study Implementation. In anticipation of this agreement, the implementation phase was kicked-off during the Startup Workshop on 12-13 November 2014.

Since then, several implementation progress milestones were achieved as reported in the 4<sup>th</sup> RTWG meeting on 10 March 2015, 41<sup>st</sup> JC Preparatory on 5 May 2015, and through several periodic progress updates via email to the Council Study focal points. The table below shows the following specific key milestones that were achieved since the 4<sup>th</sup> RTWG meeting.

Detailed work and staff planning of the thematic and discipline teams of the Council Study were completed. International and regional consultants in particular for the Hydrologic Assessment and Biological Assessment Teams were recruited in time for the technical tasks. National consultants were mostly recruited in time for technical work.
Progress on the formulation of development scenarios: <ul style="list-style-type: none"><li>• Three main development scenarios (2007 EDS, 2020 DFS, 2040 PDS) were identified and were subsequently approved during the 4<sup>th</sup> RTWG Meeting</li><li>• Draft Thematic technical work plans were developed for the formulation of the approved three main development scenarios by each of the six thematic teams. The work plans also identified thematic-sub scenarios for each thematic area.</li></ul>
Detailed Modelling Approach for the Council Study was completed. The modeling approach involved the use of DSF and supplemented by other models such as WUP-FIN and eWater. The approach was developed in consultation with MCs through TACT, RTWG, and small group technical meeting
Models were setup and calibrated to evaluate two options for baseline namely 2000 and 2007 infrastructure level using 1985 – 2008 hydrologic baseline period. Technical report containing the modelling results was submitted to the MCs in June to decide on what baseline is selected for the Council Study. Follow-up discussions were held during the 11 <sup>th</sup> TACT meeting. However, no agreement and decision have been made as of this writing.
Field Visit (Delta and Tonle Sap) and technical work sessions (during the field visit) was completed resulting to the following : <ul style="list-style-type: none"><li>• Initial set of focus sites, indicators and linked indicators for the various disciplines</li><li>• BioRA Technical Progress Note that document the selection of the focus sites and linked indicators</li><li>• Field specialist notes that document the field observations and interpretations of the specialists</li></ul>

during the field visit

Initial status and trends for several ecosystem indicators under the various disciplines were developed for all focus areas (FAs). In addition, initial response curves for several ecosystem indicators under the various disciplines were developed for Focus Areas FA1, FA2, and FA3 (mainstream Mekong River from Chiang Sean to Pak Beng). These were developed through several technical working sessions with national consultants

Council Study Website/Team site continuously maintained including upload of several technical documents and presentations such as the following:

- Literature Review Summary Report
- Comparison of Environmental Flow Assessment Tools
- Comparing the Current DRIFT Version for the Council Study from the IBFM Predictive Tool (Early Version of DRIFT)
- BioRA Technical Note 1: Focus Area and Indicator Selection
- BioRA Specialist Field Notes (from the Field Visit Part 1)
- Modelling Framework for the Council Study
- Concept Note: Formulation and Assessment of Development Scenarios
- Technical Note: Hydrological Baseline
- Working Paper: Baseline Selection for the Council Study

Several mechanisms to facilitate coordination, communication, and reporting were put in place including the following:

- Monthly Coordinating Meeting
- Bi-Weekly Meeting with Directors to discuss/resolve issues
- Weekly Progress Reporting with SSM
- Periodic Progress Reporting to MCs
- Progress Reporting to DPs as per request
- Council Study Web Site/Team Site
- Guidance Document: Managing and Technical Supervisions of Consultants for the Council Study

# Agenda Topics – Overall Approach and Road Map: Formulation of Development Scenarios and Individual Thematic Team Progress Updates

## What to Expect

The overall approach and road map that the thematic teams are following to collect/compile/analyze the data on existing and planned infrastructure associated with the development scenarios will be presented and discussed. In addition to the approved three main scenarios, several thematic sub-scenarios that are being considered will be presented by the thematic teams during their individual progress updates. **The RTWG delegates are requested to participate during the presentation and discussions; provide feedback on the schedule, approach, and the thematic sub-scenarios; and when possible help resolve any technical and data issues raised during the presentations and discussions.**

It should be noted that the formulation of development scenarios is the first step of the assessment process and the assessment phase cannot begin without completing this important milestone.

## Synopsis

During the 3<sup>rd</sup> RTWG Meeting, the following three main development scenarios were approved for assessment in the Council Study.

Scen #	Name	Level of Development*					
		ALU	DIW	FPF	HPP	IRR	NAV
1	Early Development Scenario 2007	2007	2007	2007	2007	2007	2007
2	Definite Future Scenario 2020	2020	2020	2020	2020	2020	2020
3	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040

Note:  
 \*Levels of developments for the various thematic areas: ALU = Agric/Landuse Change; DIW = Domestic and Industrial Water Use; FPF = flood protection/floodplain infrastructure; HPP = hydropower; IRR = irrigation; and NAV = Navigation

On 13 May 2015 during an internal MRCS Council Study kickoff for the formulation of the development scenarios, the thematic teams have agreed on a common overall schedule and approach for the collection/compilation/analysis of the existing and planned infrastructure associated with the above three main scenarios. In addition, **several thematic sub-scenarios were also conceptualized** (a maximum of three thematic sub-scenarios as per the Inception Report). The thematic sub-scenarios are based on 2040 Planned Development Scenario incorporating **plausible deviations** in the 2040 planned level of development for the thematic area of interest. A plausible deviation is the result of external factors such as changes in national priorities, policies, budgets, technologies, etc.

The table below shows the list of thematic sub-scenarios (scenarios 7 to 24). The list includes scenarios 4, 5 and 6 that are intended to assess impacts of climate change. All 24 scenarios are **integrated** scenarios for which a plausible level of development is assumed for each thematic area. These 24 scenarios will be primarily the basis for the cumulative and thematic assessments for the Council Study.

Scen #	Name	Level of Development*						Climate Change
		ALU	DIW	FPF	HPP	IRR	NAV	
4	Planned Development 2040 Under Low Climate Change	2040	2040	2040	2040	2040	2040	Yes – Low
5	Planned Development 2040 Under Medium Climate Change	2040	2040	2040	2040	2040	2040	Yes – Medium
6	Planned Development 2040 Under High Climate Change	2040	2040	2040	2040	2040	2040	Yes – High
7	ALU Thematic Sub-scenario 1: Low Level of implementation of 2040 Planned Development	Low	2040	2040	2040	2040	2040	No
8	ALU Thematic Sub-scenario 2: Medium Level of implementation of 2040 Planned Development	Medium	2040	2040	2040	2040	2040	No
9	ALU Thematic Sub-scenario 3: High Level of implementation of 2040 Planned Development	High	2040	2040	2040	2040	2040	No
10	DIW Thematic Sub-scenario 1	2040	Low	2040	2040	2040	2040	No
11	DIW Thematic Sub-scenario 2	2040	Medium	2040	2040	2040	2040	No
12	DIW Thematic Sub-scenario 3	2040	High	2040	2040	2040	2040	No
13	FPF Thematic Sub-Scenario 1	2040	2040	TBD*	2040	2040	2040	No
14	FPF Thematic Sub-Scenario 2	2040	2040	TBD*	2040	2040	2040	No
15	FPF Thematic Sub-Scenario 3	2040	2040	TBD*	2040	2040	2040	No
16	HPP Thematic Sub-scenario 1	2040	2040	2040	Subset of Planned mainstream HPs implemented	2040	2040	No
17	HPP Thematic Sub-scenario 2	2040	2040	2040	Reservoir Operation Alternative 1	2040	2040	No
18	HPP Thematic Sub-scenario 3	2040	2040	2040	Reservoir Operation Alternative 2	2040	2040	No
19	IRR Thematic Sub-scenario 1	2040	2040	2040	2040	Low	2040	No
20	IRR Thematic Sub-scenario 2	2040	2040	2040	2040	Medium	2040	No
21	IRR Thematic Sub-scenario 3	2040	2040	2040	2040	High	2040	No
22	NAV Thematic Sub-scenario 1	2040	2040	2040	2040	2040	TBD**	No
23	NAV Thematic Sub-scenario 1	2040	2040	2040	2040	2040	TBD**	No
24	NAV Thematic Sub-scenario 1	2040	2040	2040	2040	2040	TBD**	No

Note:

\*Formulation will be deferred later after the assessment of impacts of the planned developments in the other thematic areas

TBD – To be determined

Following the MRCS internal kickoff meeting, the thematic teams have prepared draft work plans, approach and detailed schedule and began implementing them accordingly. The approach involve the Council Study Thematic Teams (including their national consultants) to engage and consult with Member Countries line agencies through a number of mechanisms that include emails, conference calls, one-on-one meetings, small technical group meetings, and/or workshops. In addition to the individual Thematic Team meetings with the appropriate line agencies of the MCs, the overall schedule of the formulation of development scenarios will also involve the following national and regional consultations:

- 5<sup>th</sup> Regional Technical Working Group (13-15 August 2015) – discuss the progress of the formulation of development scenarios among other topics
- National Consultation (tentative: September – October 2015) – present draft formulated development scenarios including data used, data gaps filled and the adopted approach
- 6<sup>th</sup> Regional Technical Working Group (tentative: October – November 2015) – present draft final development scenarios and seek approval

# Agenda Topic - Progress Update: Hydrologic, Sediment and Water Quality Modelling including Baseline Selection and

## What to Expect

The Council Study Hydrologic Assessment Team will present progress updates primarily on the following activities:

- Specific Use of WUP-FIN model in the Council Study in conjunction with DSF
- Specific Use of eWater Source model in the Council Study in conjunction with DSF
- Selection of Baseline for the Council Study

**The RTWG delegates are expected to be familiar with the Council Study modeling approach and fully participate and provide guidance during the presentation and discussion of the abovementioned subtopics.** For reference, the following document is provided as attachment to this briefing note:

- Modelling Framework for the Council Study, 13 May 2015

For the baseline selection for the Council Study, the MCs have agreed to use baseline hydrologic period 1985 – 2008. However, the MCs agreed on the baseline infrastructure which is a choice between two options 2000 and 2007. This is despite numerous email exchanges and meetings between MRCS and the MCs including the Small Technical Working Group Meeting on 21 April 2015 in Phnom Penh, and the 11<sup>th</sup> IKMP TACT Meeting on 14-15 July 2015 in Bangkok. The TACT Members have directed the Council Study Team to raise this issue during the 5<sup>th</sup> Council Study RTWG Meeting and ask the RTWG members to decide. **Therefore, the RTWG delegates are requested to evaluate the two options baseline 2000 and 2007 and make the necessary compromises and adjustments to come up with a consensus decision.** For reference, the following document which was presented during the 11<sup>th</sup> TACT Meeting is provided as attachment to this briefing note.

- Draft Working Paper: Baseline Selection for the Council Study Modelling Support, 14 April 2015
- Working Paper Supplement: Baseline Selection for the Council Study Modelling Support – Further Information on 2000 and 2007 Flows, 19 June 2015

As an action item from the 11<sup>th</sup> TACT Meeting, the above Working Paper Supplement will be revised to address the comments received from the MCs. The comments from MCs are due on 21 July 2015.

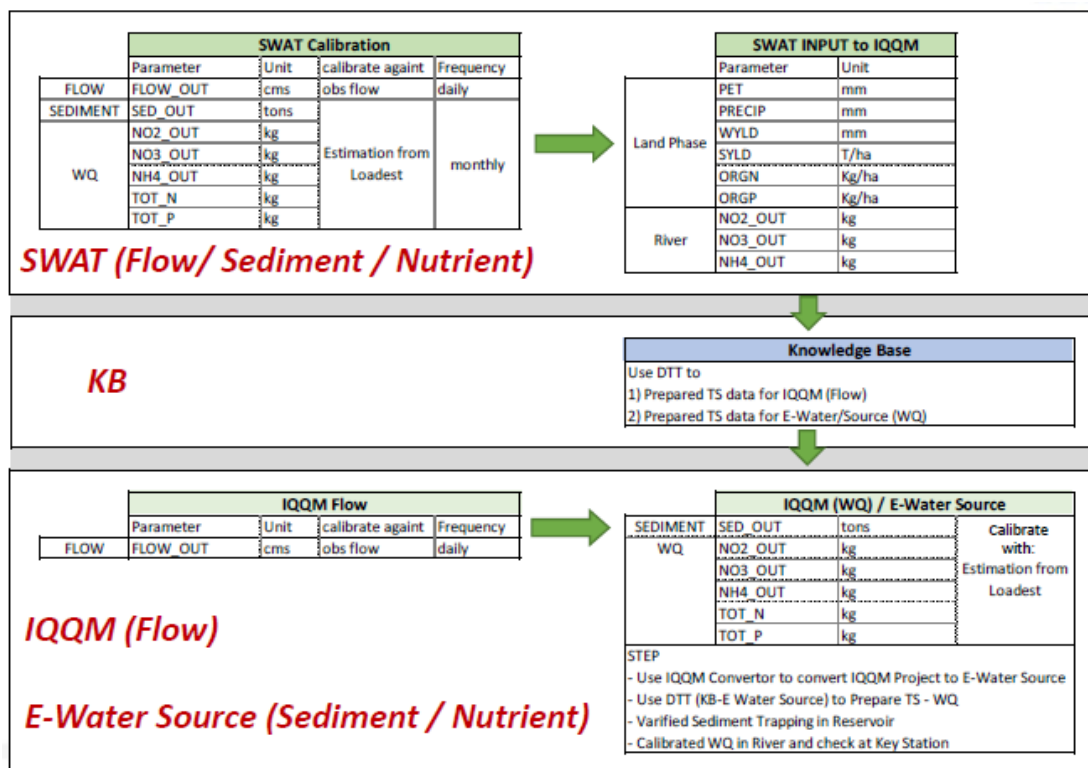
In addition to the above document, the RTWG delegates are requested to review the synopsis below about the baseline selection since it provides a comparison of the two options using additional selection criteria. It is clear from this comparison that baseline option 2007 is more preferable than option 2000 and the **Secretariat Council Study Team is recommending to the MCs to select option 2007.** If necessary, a more detailed modeling study comparing hydrologic, sediment, and water quality conditions between 2000 and 2007 will be included as part of the Council Study technical note deliverables.

## Synopsis

The MRC DSF toolbox will be used as the primary basis for the modeling work for the Council Study, in particular the use of the approved DSF models such as SWAT, IQQM, and iSIS. However, to supplement the current limitation of the DSF models with respect to modeling sediment and water quality, and in particular in complex environments such as the Delta and Tonle Sap where 2-D/3-D modeling is needed, other models such as WUF-FIN and eWater Source will be used as per the modeling approach approved for the Council Study. The overall modeling approach was presented and approved by the TACT during the 10<sup>th</sup> IKMP TACT Meeting on 3-4 February 2015. In addition, eWater Source which was presented during the TACT meeting was also recommended as a potential tool for the Council Study. Subsequently, the details of the modeling approach have been presented during the 4<sup>th</sup> RTWG meeting and more recently during the 11<sup>th</sup> TACT Meeting.

**Specific Use of WUP-FIN models in the Council Study in conjunction with DSF.** WUP-FIN models VMOD and 3D-EIA are considered as supplementary tools to model sediment and nutrient in Tonle Sap Great Lake (Zone 4) and in Mekong Delta (Zone 5). It should be noted that for hydrology and hydraulic modeling, the DSF models will be used for all zones (Zone 1-5).

**Specific Use of eWater Source model in the Council Study in conjunction with DSF.** eWater Source is used in conjunction with DSF Models SWAT and IQQM for Zones 1 to 3 to route sediment and nutrients instream (along the Mekong River) and through the reservoirs. The figure below illustrates the linkages between the models. In order to make this happen, several tools are being developed including: IQQM converter tool, Data Transfer tool, and plugins for hydropower dam operation rule curves and sediment trapping in reservoirs.

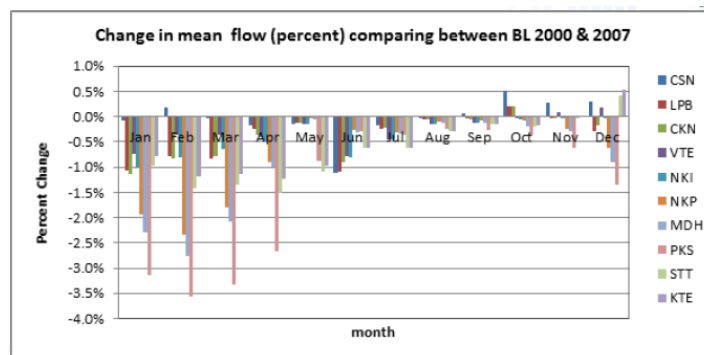
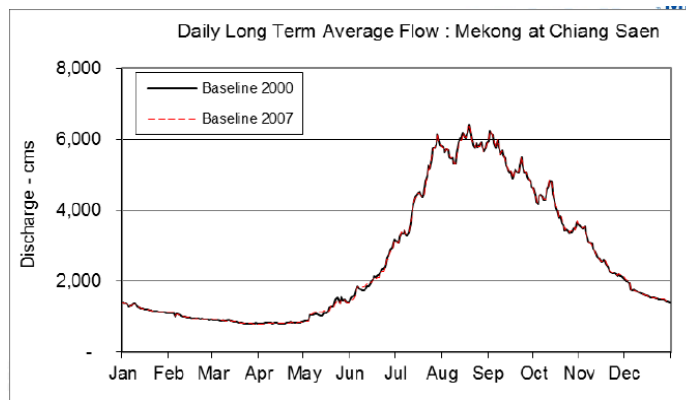




**Selection of Baseline for the Council Study.** As per request of MCs and in order to assist the selection of the baseline infrastructure for the Council Study, the Council Team Hydrologic Assessment Team developed two separate DSF models one for baseline infrastructure 2000 and the other for baseline infrastructure 2007 and were both run for the baseline hydrologic period of 1985 – 2008. The table below shows what infrastructures are included in each model.

Infrastructure	Baseline Infrastructure = 2000	Baseline Infrastructure = 2007
Hydropower	2000 (includes one China Dam: Manwan Dam)	2007 (includes two China Dams: Manwan and Dachaoshan)
Irrigation	2000	2007
Domestic and Industrial Water Use	2000	2007
Land Use	2003	2003

The modeling results of the two models (2000 vs. 2007) show that the difference in the simulated flows along the Mekong River is relatively small. For example the figure immediately below shows that in Chiang Saen, the simulated daily average flows from the two models are almost identical. The second figure below shows that the simulated daily average flows remain also not significantly different at other locations of the Mekong River. The maximum difference is approximate 3.5 percent in Pakse during the low flow season. This means that the results of the model simulations cannot be used to differentiate the two models to assist in the selection. It appears that both models represent the same hydrologic pattern in the mainstream Mekong river, which is near natural conditions. With respect to sediment and nutrient loads, a comparison could not be made because the models were not ready to simulate sediment and nutrient transport.



The table below summarizes the comparison between using baseline 2000 vs. baseline 2007 using additional criteria. **It is clear from this comparison that option 2007 is more preferable than option 2000 and the Secretariat Council Study Team is recommending to the MCs to select option 2007.**

Criteria	2000	2007
Hydrology	Represents near natural hydrologic conditions in the Mekong Mainstream River.	Similar to 2000, represents near natural conditions in the Mekong Mainstream River. The model comparison between models 2000 vs. 2007 shows both models producing very similar hydrologic pattern in the Mekong Mainstream River with almost identical characteristic in terms of average daily flow.
Sediment Transport	Not available	Not available
Nutrient Transport	Not available	Not available
Development scenarios for which Impacts will be assessed against selected baseline	<p>Impacts associated with the following scenarios will be assessed.</p> <ol style="list-style-type: none"> <li>1) Early Development Scenario 2007 (i.e., changes from 2000 to 2007)</li> <li>2) Definite Future Scenario 2020 (i.e., changes from 2000 to 2020)</li> <li>3) Planned Development Scenario 2040 (i.e., changes from 2000 to 2040)</li> </ol>	<p>Since Option Baseline 2007 is technically equivalent to Early Development Scenario 2007, then impacts will only be assessed on the following development scenarios:</p> <ol style="list-style-type: none"> <li>1) Definite Future Scenario 2020 (i.e., changes from 2007 to 2020)</li> <li>2) Planned Development Scenario 2040 (i.e., changes from 2007 to 2040)</li> </ol> <p><b>*Note: This may be supplemented by determining impacts of 2007 development scenario from a significantly pre-development baseline, the methodology of which is still to be defined (i.e., changes from significantly pre-development year to 2007)</b></p>
Level of Effort	<p>Higher level of effort and therefore NOT compatible with the current budget constraints of the Council Study</p> <p>The thematic teams have begun assembling infrastructure data for Early Development 2007 scenario which can then be used to further enhance the model for option baseline 2007.</p>	<p>Lower level of effort and therefore compatible with the current budget constraints of the Council Study</p> <p>Why Lower Level of Effort:</p> <ol style="list-style-type: none"> <li>1) Choosing this as baseline will be equivalent to the approved Early Development Scenario (2007) and therefore, the number of scenarios to be assessed is reduced</li> </ol>

	<p>If baseline 2000 is selected, then the thematic teams will have to assemble infrastructure data for Year 2000 also. While this data is available from BDP2, the infrastructure data for the other thematic teams (agriculture and land use, navigation, and flood protection and floodplain infrastructure) that were not included in BDP2 have to be newly created. In addition, the BDP2 infrastructure data for irrigation, hydropower, and domestic and industrial water use (e.g., including sand extraction) will have to be updated.</p> <p>In addition, if baseline 2000 is selected, the level of effort required to determine impact of 2007 developments against a 2000 baseline (a period of seven years) may not provide meaningful results relatively speaking, and therefore, may not be the best use of limited resources of the Council Study</p>	<ul style="list-style-type: none"> <li>2) Most of the recent modelling efforts (including DSF for sediment and water quality and WUFIN) have been devoted to setting up/calibrating/validating for 2007</li> <li>3) The BioRA Team has been populating the DRIFT-DSS and the response curves based on 2007 modelling results provided by the Modelling Team. If 2000 is chosen instead, then while the response curves developed are expected to remain the same, the DSS have to be adjusted to show that 2000 modelling results were used in developing the response curves</li> <li>4) Baseline data (ecosystem, socio-economic, sediment, water quality) for 2007 are more available than 2000 because of recent additional data collected</li> </ul>
<p>Compatibility with other projects</p>	<p>Some data (irrigation, hydropower, domestic/industrial water use) is available from BDP2 but as noted above, the data will have to reviewed and updated. For example, sand extraction will have to be included and new and improved methodology for determining domestic and industrial water use (including pollution discharges) will have to be incorporated.</p>	<p>Mekong Delta Study baseline is also based on 2007. Therefore, there is opportunity to share baseline data, and compare/contrast/validate baseline results of Council Study with the Mekong Delta Study</p>

# Agenda Topic - Progress Update: Biological Resource Assessment

## What to Expect

The Council Study Biological Resources Assessment (BioRA) Team will present progress updates primarily on the following technical topics:

- Field Visit (Delta and Tonle Sap)
- Selection of Focus Areas and Indicators
- Assessment of Status and Trends
- Development of Response Curves.

**The RTWG delegates are expected to fully participate and provide guidance during the presentation and discussion of the abovementioned subtopics.**

For reference, the following documents are provided as attachment to this briefing note:

- Appendix D: Field Trip Part 1: Specialist's Field Notes
- BioRA Progress Report Report 1: Focus Areas and Indicators

The BioRA Progress Report 2 on Status and Trends and Knowledge Capture Workshops (Response Curves) will be available during the first week of August 2015. In the meantime, the readers are referred to the Council Team Site for the following presentations:

### **BioRA Technical Working Sessions/Knowledge Capture Workshops, 4 – 11 July, OSV**

Document	Date
<a href="#">Draft Agenda</a>	4 July 2015
<a href="#">BioRA National Counterparts Catch-Up Session</a>	5 July 2015
<a href="#">BioRA Introduction</a>	6 July 2015
<a href="#">Geomorphology Background and Progress</a>	6 July 2015
<a href="#">Geomorphology Status and Trends</a>	6 July 2015
<a href="#">Vegetation Background and Progress</a>	6 July 2015
<a href="#">Vegetation Status and Trends</a>	6 July 2015

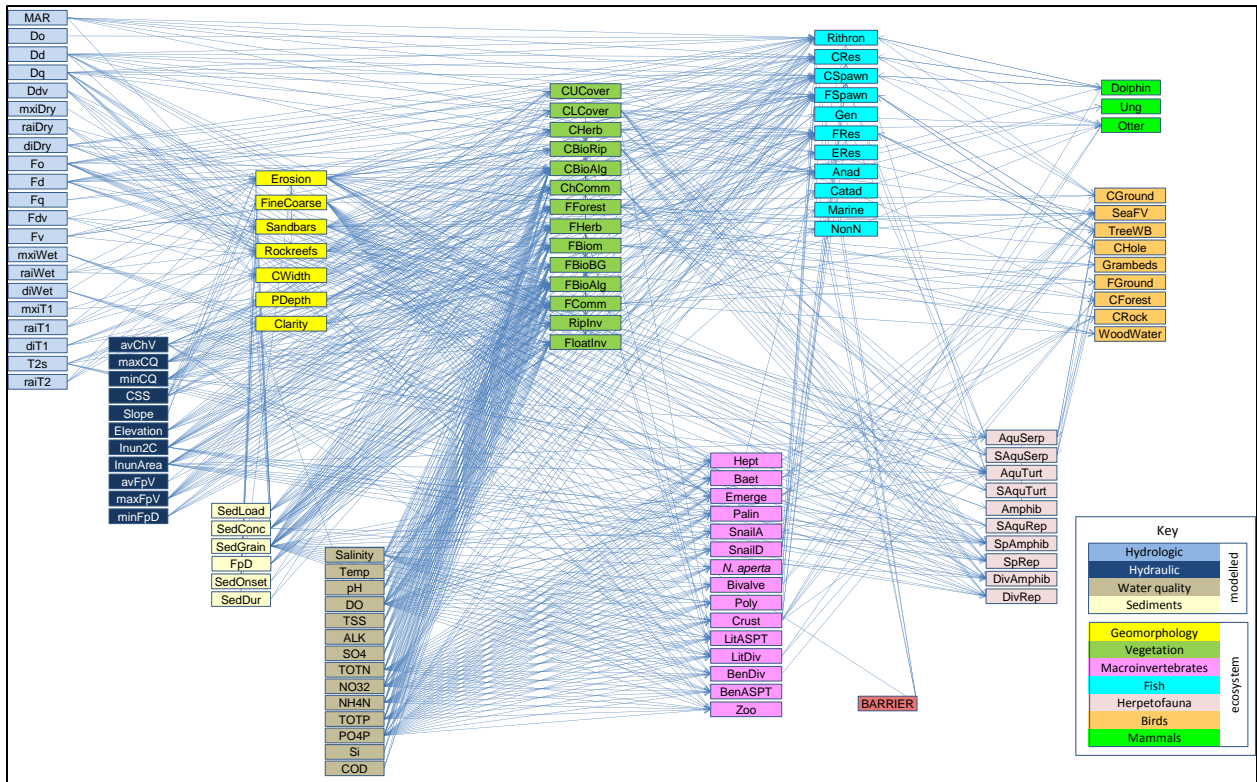
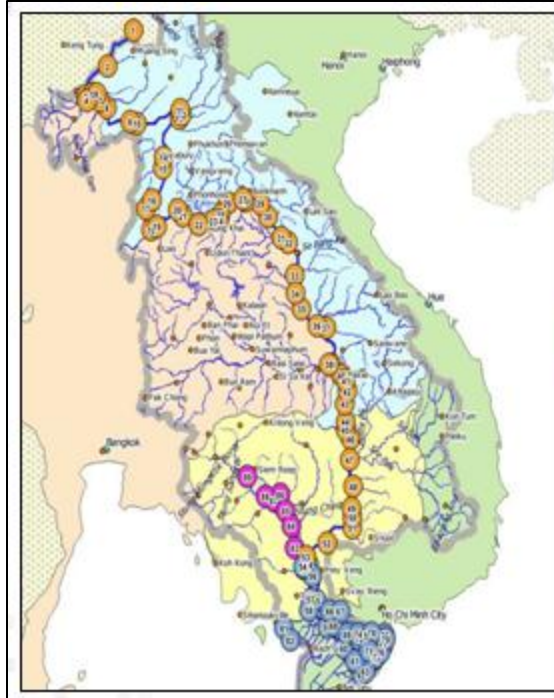
<a href="#">Fish Background, Progress, and Status and Trends</a>	6 July 2015
<a href="#">Invertebrates Background, Progress, and Status and Trends</a>	6 July 2015
<a href="#">Herptiles Background and Progress</a>	6 July 2015
<a href="#">Herptiles Status and Trends</a>	6 July 2015
<a href="#">Birds and Mammals Background and Progress</a>	6 July 2015
<a href="#">Birds and Mammals Status and Trends</a>	6 July 2015
<a href="#">Next Steps</a>	11 July 2015

## Synopsis

**Field Visit (Delta and Tonle Sap) and Technical Working Sessions during the Field Visit.** The BioRA Team completed the field visit in the Delta and Tonle Sap on 18-28 March 2015. The field visit provided specialists the opportunity to familiarize themselves with the study areas in a multidisciplinary environment where experts shared and discussed their understanding of the characteristics of the sites based on field observations and their potential to be selected as focus areas for the biological resources assessment. In lieu of the national specialists, who were not contracted at that time of the field visit, the BioRA specialists were accompanied by participants from the Member Countries, some of whom were later contracted as national specialists.

During the field visit, technical working sessions were also conducted. During these sessions, together with the Member Countries, a hands-on “training” session on DRIFT was conducted, focus areas were selected and draft lists of BioRA indicators and linked indicators were prepared. The map below shows the focus areas (FA1 to FA8) that were derived from a spatial overlay and statistical analysis of several relevant data such as hydrological zones, geomorphological zones, fish migration pathways, socio-economic zones, existing and planned infrastructure, land use/land cover, and national borders. The following figure shows the initial links between indicators.

In addition to the several technical presentations available in the Council Study Team Site, the BioRa Progress Report 1 on Focus Areas and Indicators, which include Appendix D on Specialist Field Notes were a direct output of the field visit and the technical working sessions.



### Technical Working Sessions on Assessment of Status and Trends and Development of Response

**Curves.** The BioRA Team (with the national specialists/consultants) conducted a series of technical working sessions on 4-11 July 2015 to:

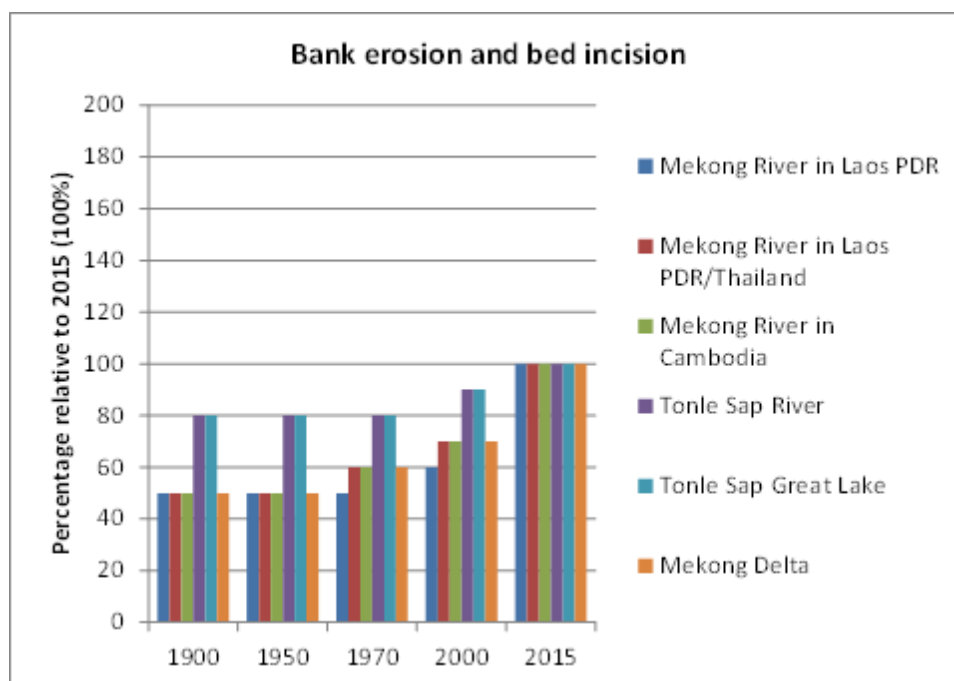
- i) describe the status and trends (past, present, future) in the Lower Mekong River Basin in terms of selected ecosystem indicators under various disciplines (geomorphology, vegetation, fish, invertebrates, reptiles and amphibians, and birds and mammals) at different focus areas;
- ii) begin development of response curves for the selected linked indicators for initial set of focus areas (FA1, FA2, and FA3).

To illustrate, the following indicators were selected under the geomorphology discipline.

Geomorphology Indicator	Description
Erosion (bank / bed incision)	This indicator will be linked to channel shear stress, sediment loads and timing of delivery and geomorphic model outputs. The aim is to assess how flow and sediment changes will translate into changes in the physical attributes of the river channel (bed and banks).
Average bed sediment size (DRY)	Sediment fining / coarsening will be linked to the sediment load and sediment grain-size analysis output from the models and will be used to assess how flow and sediment changes will change the characteristics of the channel. It is aimed at understanding physical changes to the river which could also affect the ecology through changes in habitat quality and distribution.
Availability of exposed sandy habitats on bars and banks in the dry season	This indicator has two aims – the first is to inform whether bank erosion or aggradation is altering the size/exposure of sandy bars, islands and insets. Geomorphically this is important as these sandy features exert important controls on channel stability. Sandy substrates are also important from a habitat perspective, so the second aim of this indicator is to inform how/if habitat distributions are changing.
Availability of exposed rocky habitats in the dry season	Exposure of rocky reefs is linked to erosion / deposition and water level. Geomorphically, changes to the exposures of rocky reefs result from increased or decreased erosion / deposition of sands in river channel areas underpinned by bedrock. Ecologically, rocky reefs are important aquatic and terrestrial habitats.
Depth of bedrock pools	The deep pools in the LMB are important hydraulic characteristics of the river and are directly related to sediment transport patterns. Pool depth will be sensitive to energy and sediment alterations in the river. Ecologically, pools provide important aquatic habitat and refuge.

Water clarity	Water clarity is directly linked to sediment transport and grain-size distribution of suspended material. It is an important ecological indicator for primary production.
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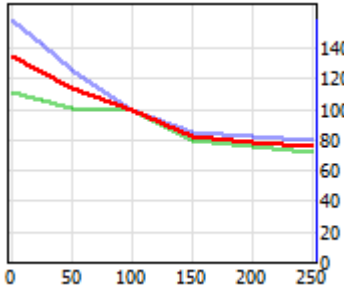
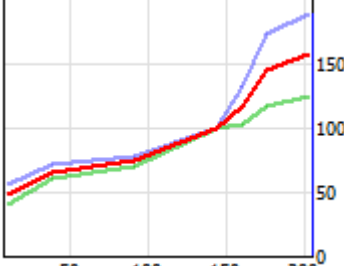
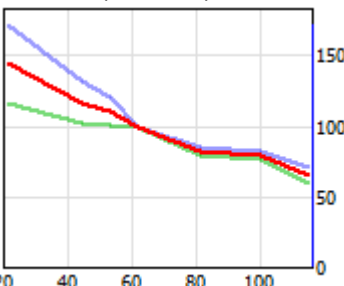
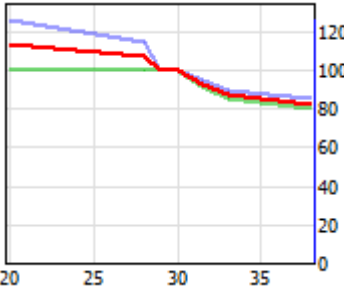
Based on a combination of data, related studies, and the expert opinions of the international and national specialists, the following graph was prepared to initially describe the status and trends of the indicator bank erosion including bed incision. During the course of the technical working sessions, some of the values were modified based on discussions with other specialists, input from the National Consultants and additional literature review. A revised Status and Trends assessment is contained in Progress Report 2.



The results of the first draft of the status and trends assessments for all the indicators under the various disciplines were presented for discussion on 6<sup>th</sup> July 2015 at a BioRA technical working session. These presentations can be downloaded from the Council Study Team Site. These were then updated and the updated information will be included in the upcoming BioRA Progress Report 2 due on first week of August.

Initial response curves between the bank erosion indicator and its linked indicators for FA1 (Pak-Beng) are shown below. The linked indicators that influence the bank erosion indicator include biomass riparian vegetation, wet duration, average sediment duration, average sediment onset, average grain-size distribution, average sediment load, and average channel Shear stress. The time-series values for these linked indicators are mostly derived from the DSF model. These initial response curves, and the explanations, are stored in the latest version of DRIFT, and are currently being updated.



Linked Indicator with Geomorphology Indicator: Bank Erosion (including bed incision)	Response Curve	Explanation
Biomass riparian vegetation	<p>Bank Erosion vs. Biomass riparian vegetation</p> 	<p>Biomass increases bank stability by increasing roughness of the bank, which reduces shear stress. Increasing the presences of biomass on the banks will reduce erosion rates, and decreasing biomass would be expected to increase erosion.</p>
Wet Duration	<p>Bank Erosion vs. Wet Duration</p> 	<p>The longer the duration of the wet-season, the longer the relatively high shear stress will act on the banks and bed, thus leading to an increase in erosion.</p>
Average Sediment Duration	<p>Bank Erosion vs. Average Sediment Duration (F Season)</p> 	<p>The shorter the duration of sediment transport, the less sediment is available at the end of the wet / T2 season for deposition.</p>
Average Sediment Onset	<p>Bank Erosion vs. Average Sediment Onset (F Season)</p> 	<p>The timing of sediment onset determines how much sediment is available during the wet and T2 season which is available for deposition. The later the sediment onset delivery, the higher the probability that sediment will be available for deposition during T2. Note that it is also recognized that the late onset of sediment delivery can promote net erosion due to increased erosion at the satart of the wet season. For this reason the range of the response curve is relatively small.</p>
Average Sediment Grain-Size Distribution	<p>Bank Erosion vs. Average Sediment Grain-Size Distribution (F Season)</p>	<p>The smaller the grain-size, the more likely that sediment will remain in suspension and be transported through the system rather than deposited. If everything else</p>

		<p>remains the same, erosion will increase relative to present conditions as grain-size decreases as there will be less deposition and the same erosion. The X-axis represents the median of the size classes, <math>0.00 \leq &lt; 0.002</math></p>
<p>Average Ch Shear Stress</p>	<p>Bank Erosion vs. Average Ch Shear Stress (F season)</p>	<p>Erosion is directly related to the shear stress acting on the bed or the banks. The higher the shear stress, the higher the likelihood of erosion and vice versa. T2 is the season when deposition is most likely to occur, so an increase in shear stress during this period would both decrease the likelihood of deposition and increase the risk of erosion.</p>

## Agenda Topic - Progress Update: Climate Change Scenarios for the Council Study

### What to Expect

The Council Study Climate Change Assessment Team will present progress updates on selection of three climate change scenarios for the Council Study. These three climate change scenarios will be used as a basis for evaluating impacts of climate change on the environment and socio-economic conditions in the Lower Mekong Basin in conjunction with water resources developments and management.

**The RTWG delegates are expected to fully participate and provide guidance during the presentation and discussion of this agenda topic.**

### Synopsis

The Climate Change and Adaptation Initiative (CCAI) Programme as part of the Mekong Adaptation Strategy and Action Plan (MASAP) has identified nine basin-wide climate change scenarios for LMB. These nine climate change scenarios cover the range of climate change projections for the LMB and represent the following:

- i. three magnitudes of climate change due to low, medium and high scenarios of carbon emission in the future and
- ii. three seasonal patterns of climate change including increase of precipitation in both dry and wet seasons (wetter overall), decrease of precipitation in both dry and wet seasons (drier overall) and increase of precipitation in wet season but decrease in dry season (increase of seasonality)

**The Council Study Climate Change Assessment Team led by CCAI will evaluate these nine scenarios further and select the three most appropriate scenarios to use for the Council Study.**

These nine basin-wide climate change scenarios are shown in the following table:

#### **Low Climate Change Scenarios** (Associated with low future GHG emission scenarios)

Scenario 1: Drier overall-low represents a slight decrease of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP2.6, GISS-E2-R-CC GCM and low climate sensitivity.

Scenario 2: Wetter overall-low represents a slight increase of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP2.6, GFDL-CM3 GCM and low climate sensitivity.

Scenario 3: Increase seasonality-low represents a slight increase in basin-average precipitation in the wet season and a slight decrease in dry season in the future. The scenario is formulated using RCP2.6, IPSL-CM5A-MR GCM and low climate sensitivity.

**Medium climate change scenarios (Associated with medium future GHG emission scenarios)**

Scenario 4: Drier overall-medium represents a medium decrease of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP6.0, GISS-E2-R-CC GCM and medium climate sensitivity.

Scenario 5: Wetter overall-medium represents a medium increase of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP6.0, GFDL-CM3 GCM and medium climate sensitivity

Scenario 6: Increase seasonality-medium represents a medium increase of basin-average precipitation in wet season and a medium decrease in dry season. The scenario is formulated using RCP6.0, IPSL-CM5A-MR GCM and medium climate sensitivity.

**High climate change scenarios (Associated with high future GHG emission scenarios)**

Scenario 7: Drier overall-high represents a large decrease of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP8.5, GISS-E2-R-CC GCM and high climate sensitivity.

Scenario 8: Wetter overall-high represents a large increase of basin-average precipitation in both wet and dry seasons in the future. The scenario is formulated using RCP8.5, GFDL-CM3 GCM and high climate sensitivity.

Scenario 9: Increase seasonality-high represents a large increase of basin-average precipitation in wet season and a large decrease in dry season. The scenario is formulated using RCP8.5, IPSL-CM5A-MR GCM and high climate sensitivity.

## **Agenda Topic - Progress Update: Scoping Mission for the Socio-Economic and Macro-Economic Assessment**

### What to Expect

The planned scoping mission on 14-26 September 2015 at OSV of the Council Study Socio-Economic and Macro-Economic Assessment Discipline Team will be presented. The participants of the scoping mission will include the Council Study Socio-Economic and Macro-Economic team led by BDP, the Secretariat Socio-Economic Working Group, national consultants, and international consultants.

**The RTWG delegates are expected to fully participate and provide guidance during the presentation and ensuing discussion of this agenda topic.**

### Synopsis

The objective of the mission is to scope the integrated macro-economic and socio-economic assessment of the scenarios and develop the approach and methodology of the assessment, taking into account the planned and ongoing activities and input of the other Council Study Teams in particular, the Thematic Teams, and the discipline teams such as Hydrologic Assessment Team, Biological Resource Assessment Team, and the Climate Change Team.

The anticipated main outputs of the mission include the following:

The main output of the mission is a scoping report that covers the following information:

- The scoping of the macro-economic and socio-economic assessment;
- The approach of the macro-economic and socio-economic assessment;
- The review of the MRC Indicator Framework and the selection of assessment indicators and supporting monitoring parameters;
- The preliminary methodology for evaluation (and preferably quantification) of the selected assessment indicators;
- The testing of the approach and methodology, based on the 2009-2011 scenario assessment (BDP 2), and aimed at the evaluation of the distribution of benefits, costs, impacts and risks of water resources development in the Mekong basin;
- Data acquisition plan for the macro-economic and socio-economic assessment;
- Implications and guidance for thematic and other discipline teams as needed; and
- Work plan of the implementation of the macro-economic and socio-economic assessment.

# Agenda Topic – Overall Schedule and Next Steps

## What to Expect

The overall implementation schedule will be reviewed and necessary revisions made. The Council Study budget situation will be discussed. Council Study tasks and deliverables anticipated to be completed in 2015 or early 2016 for the given secured budget will be discussed. It should be noted that the revised implementation schedule will be presented during the upcoming 42<sup>nd</sup> JC Meeting.

**The RTWG delegates are expected to fully participate during the discussion and provide guidance on the implementation schedule and next steps.**

## Synopsis

As per recommendation during the 4<sup>th</sup> RTWG Meeting, a 6-month extension of the implementation schedule was proposed during the 41<sup>st</sup> JC Meeting in Siem Reap, Cambodia (see Gantt chart below). All MCs agreed on the need to extend the Council Study. While three of the four MCs supported the proposed 6-month extension, the consensus was to re-evaluate the progress of the implementation of the Council Study in the next RTWG meeting (5<sup>th</sup> RTWG Meeting) and based on that determine appropriate duration of proposed extension. The proposed duration of the extension will be raised during the 42<sup>nd</sup> JC Meeting.

Num	Tasks	2014			2015												2016									
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
0	Study Management and Coordination																									
1	Detailed Work Plans and Staffing Plans																									
2	Consolidated Work Plan and Staffing Plan																									
3	Startup Meeting/ 3rd RTWG Meeting (Nov 12-14, 2014)		*																							
4	Recruit Team Personnel																									
5	Select Baseline																									
6	Formulate Development Scenarios																									
7	Assess Direct Socio-Economic Impacts																									
8	Assess Hydrologic Impacts (including Sediment/Water Quality)																									
9	Assess Bioresource Impacts																									
10	Assess Indirect Socio-Economic Impacts																									
11	Scoping of Macro-Economics Study																									
12	Assess Macro-Economic Impacts																									
13	Assess Climate Change Impacts																									
14	Assess East Seas Coastal Area Impacts																									
15	Prepare Technical Reports																									
16	Prepare Cumulative/Thematic Reports																									
17	RTWG Meetings		*				*				*			*						*			*			
18	National Consultations			*						*								*								
19	Regional Stakeholder Meetings								*		*					*		*								
20	Closeout Activities																									

The table below shows the budget summary of the Council Study. A significant funding gap of USD 2.5 M remains and this is with the assumption that the potential funding from U.S. will come through. This funding gap is anticipated to cover the Council Study activities in 2016 and successfully complete the Study.

The current secured funding of USD 3.7 M will cover the Council Study activities in 2015 and perhaps first quarter of 2016. The Council Study outputs that can be delivered from this secured funding will be identified and discussed. The schedule for the remaining Council Study outputs will be subsequently re-evaluated and revised if necessary depending on when funding of the remaining funding gap becomes available and the MRC new structure in 2016.

### Funding Gap

Budget Item	Amount (USD)
External Funding Required.	6.2M
Secured Funding (see details in another table below)	3.7 M
<b>Funding Gap ( needed to finance 2016 activities)</b>	<b>2.5 M</b>

### Secured (or expected to be secured) Funding

Development Partner	Amount (USD)	Notes
Finland	650,400	Secured (Trust Fund)
Australia	463,820	Secured (Trust Fund)
Luxembourg	500,000	Secured (Trust Fund)
Luxembourg	500,000	Secured (Programme-Managed)
Germany	260,000	Secured (Trust Fund)
DPs of ISH Programme	165,000	Secured (Programme-Managed)
SDC	500,000	Secured (Trust Fund)
Finland	200,000	Secured (Programme-Managed)
USA	500,000	Expected to be Secured (Trust Fund)
<b>TOTAL</b>	<b>3,740,000</b>	