

Annex I

Work Packages for the Council Study Thematic and Discipline Teams

Work Package 1: Agriculture & Land-use Change Thematic Team

This work package will be covered by the Thematic Team working on Agriculture and Land-Use Change. The activities indicated here are for the team to assess the direct impacts, provide information required to assess the impacts via the hydrological cycle, compile the relevant thematic report and provide input for the cumulative report.

Activity	Notes	Intermediate Outputs	
2. Estimate land-use/land cover change patterns over the study period describing development patterns & significant anthropogenic processes that affect the basin area	Access district level national land-use plans including agricultural projections, mining concessions, plantation (i.e. rubber, palm) concessions, conservation areas, production forests etc.	Data for hydrologic model	Data for Water Quality model & Sediment model.
3. As required incorporate the projects selected to be assessed by this study in the six thematic areas to update a master map of water resources developments/infrastructure assessed by the Council Study	The Six thematic areas are: Irrigation, Domestic & Industrial use, Flood protection structures & flood plain infrastructure, Hydropower development, Transportation (including navigation & roads on major floodplains)		
4. Describe each land-use/land cover category in terms required to estimate their impact on surface-water conditions, e.g. sediment yield & surface runoff, using hydrologic models	To model changes in runoff, channel scour, & sediment discharge, & a loss of surface-water access to the groundwater table		
5. Estimate investment costs for each scheme	Using national estimates, average costs for similar investments. The data sources need to be clearly indicated	Data for Soc-econ report	Data for Macro-econ report
6. Estimated production value, overall benefit & disaggregated benefits including employment benefits from major planned land-use changes	to clearly indicate overall economic value & to delineate specific communities that benefit. Reflect poverty alleviation & economic development benefits This should be compatible with Socio-economic report		
7. Evaluate direct impacts of land-use change in terms of associated social displacement, loss of access to natural resources & sites of cultural importance	Provide credible quantitative & qualitative information on the social impact of these developments. Consider gender dynamics	Data for Soc-econ report	
8. Evaluate direct impacts of planned land-use change projects development in terms of land-use change & associated loss of terrestrial biodiversity, forest cover, & ecosystems	Provide credible quantitative & qualitative information on the environmental impact of these developments. Consider endangered species & unique ecosystems		
9. Estimate the impact of mining development on water quality & sediment runoff	Based on the mapping of mining concessions & based on the existing examples of similar mining activity		
10. Incorporate comments from the RTWG, Project Coordination Team & MRCS programs	Comments will be collated & coordinated by the study coordinator		

Final Deliverables:

1. A thematic report on Land-use/land cover changes on the social, economic & environmental parameters of the basin incorporating the outcomes of the irrigation report
2. A comprehensive Land-use/land cover map for the Council Study

Work Package 2: Irrigation Thematic Team

This work package will be covered by the Thematic Team working on Irrigation. The activities indicated here are for the team to assess the direct impacts, provide information required to assess the impacts via the hydrological cycle, compile the relevant thematic report and provide input for the cumulative report.

Activities	Notes	Intermediate Deliverables	
1. Access data on existing & planned irrigation schemes	Update information from BDP and AIP. Data areas include: geographical location; irrigation water requirement for different crops; evapotranspiration; type of irrigation technique used		
2. Map planned and existing irrigation projects throughout the basin with basic info on each project (i.e. extent, basic water use & season, intake points)	This map will enable the RTWG to choose the projects that would be assessed in the council study	Detailed map with info on each project	
3. Describe selected irrigation development projects. Indicate general parameters including extent of development, crops, impact on land conversion, infrastructure including parameters of headworks & weirs	This is a general description of the irrigation sector for use by other disciplines and as introduction to the thematic report on irrigation	Intermediate report	Input to fisheries assessment, Env assessments, Soc-econ assessments
4. Estimate water intake & return flows for each project & develop time-step estimates	In a format compatible with hydrology analysis. Include use of ground water when appropriate	Data for Hydrology Modeling	
5. Identify baseline, trends and potential of groundwater use for irrigation and its impact on downstream hydrology	Should clearly indicate hotspots		
6. Estimate fertilizer & pesticide use & develop time-step estimates (Weekly or daily) of pesticide & nutrient loading/run-off	In a format compatible with water quality analysis	Data for Water Quality Monitoring	
7. Estimate investment costs for each scheme	Using national estimates, average costs for similar investments. The data sources need to be clearly indicated	Data for Soc-econ report	
8. Estimate production value, overall benefit and disaggregated benefits including employment benefits from each scheme	to clearly indicate overall economic value and to delineate specific communities that benefit. Reflect poverty alleviation & economic development benefits This should be compatible with Socio-economic report		
9. Evaluate direct impacts of project development in terms of land use change & associated social displacement, loss of access to natural resources & sites of cultural importance	Provide credible quantitative & qualitative information on the social impact of these developments. Consider gender dynamics		
10. Evaluate direct impacts of project development in terms of land use change & associated loss of terrestrial biodiversity, forest cover, & ecosystems	Provide credible quantitative & qualitative information on the environmental impact of these developments. Consider endangered species & unique ecosystems	Data for Sediment modeling	
11. Study impact of selected irrigation projects on soil moisture & eventual erosion. Identify hotspots & estimate sediment loading	Should clearly indicate problem areas (steep slopes, soil conditions, proximity to river etc.)		
12. Incorporate comments from the RTWG, Project Coordination Team & MRCS programs	Comments will be collated & coordinated by the study coordinator		

Final Deliverable: Thematic report on irrigation development

Work Package 3: Navigation Thematic Team

This work package will be covered by the Thematic Team working on Navigation. The activities indicated here are for the team to assess the direct impacts, provide information required to assess the impacts via the hydrological cycle (if any), compile the relevant thematic report and provide input for the cumulative report.

Activities	Notes	Intermediate Deliverables	
1. Map planned and existing navigation related infrastructure projects throughout the basin & provide basic info on each project	This map will enable the RTWG to confirm the infrastructure/water use developments to be assessed in the council study		
2. Provide detailed data & information for selected projects - geographical location & extent (i.e. of channel stabilization, dredging), phased development plans, design specifications, operational guidelines and practices.	Information required to assess hydro morphological changes to the river channel. Consult with hydraulic and hydrological modelers. River engineering measures that may impair the original hydro-morphological situation (e.g. bed-load transport, morpho-dynamic development of the channel network, exchange processes between rivers & floodplains, groundwater regime)	Data for Hydrological & Hydraulic modelling	Data for Sediment Modelling
3. Provide detailed data & information on riverbed stabilization works and dredging, possibility of decoupling of the river from floodplain habitats, potential for pollution, & any other issue that may have an environmental impact	Information required to assess impacts on the natural composition of ecological communities (e.g. through barriers for migratory fish species or destruction of riverbank & riverbed habitats & spawning places) & on ecologically important in-stream structures		Data for Biological resources team
4. Assess direct impacts on surrounding communities including potential impairments to the movement of small boats, social displacement, demographic change, loss of access to resources, cultural impacts, gender impacts etc.	These are impacts on the communities in the immediate vicinity of the proposed project.	Data for Soc-econ report	
5. Estimated revenue, overall benefit & disaggregated benefits including employment benefits from each project	Estimate the following: direct revenue to operators (of locks etc.), and from increased commerce. Compare costs to available transport alternatives. Estimate the incidence of benefits amongst different sectors. Use national investment plans, project feasibility documents etc.		Data for Macro-econ report
6. Estimate investment costs for each project	Access national investment plans, project feasibility documents etc. to estimate the investments required to build, operate & maintain each project		
7. Based on the outcome of the hydrological analysis estimate the impact (positive or negative) of development in others sectors on navigation. Describe in quantitative (i.e. monetary) & qualitative terms	The hydrological analysis will indicate changes in the flow regime due to the infrastructure/water use developments assessed. This can change parameters pertaining to navigability. I.e. increases/decreases in navigable extent/time period due to HEP dams or irrigation intake		
8. Incorporate comments from the RTWG, Project Coordination Team & MRCS programs	Comments will be collated & coordinated by the study coordinator		

Final Deliverable: Thematic report on navigation

Work Package 4: Hydropower Thematic Team

This work package will be covered by the thematic team working on Hydropower. The activities indicated here are for the team to assess the direct impacts, provide information required to assess the impacts via the hydrological cycle, compile the relevant thematic report and provide input for the cumulative report.

Activities	Notes	Intermediate Deliverables	
1. Develop a comprehensive map of hydropower projects throughout the basin & provide basic info on each project	This map will enable the RTWG to confirm the infrastructure/water use developments to be assessed in the council study	Detailed map with info on each project	
2. Assess data, assumptions, methodologies used and results of key related studies assessing the impact of HEP	This refers to the parameters used to describe individual Hydropower projects not their impacts social, environmental or economic indicators.		
3. Provide data & detailed information for selected projects - GIS points, Run-of-river or storage, capacity, phased development plans, design specifications (including spillway & Intake, headrace canal/tunnel, tailrace) operational guidelines & practices.	Consult with hydraulic and hydrological modelers. River engineering measures that may impair the original hydro-morphological situation (e.g. bed-load transport, morpho-dynamic development of the channel network, exchange processes between rivers & floodplains, groundwater regime) and impacts on the natural composition of ecological communities (e.g. through barriers for migratory fish species or destruction of riverbank & riverbed habitats & spawning places) & on ecologically important in-stream structures	Data for Sediment Modelling	Data for Hydrologic Modelling
4. Assess projected power demand and estimate likely operational scenarios for the dam to estimate water release patterns.	Information required to assess hydrological changes to the flow regime.		
5. Estimated revenue, overall benefit & disaggregated benefits including employment benefits from each project	Estimate the following: direct revenue to operators & multiplier effect. Compare costs to available alternatives. Estimate the incidence of benefits amongst different sectors. Use national investment plans, project feasibility documents, MRC SEA of Mainstream dams etc.	Data for Soc-Econ Report	Data for Macro-econ report
6. Estimate investment costs for each project	Access national investment plans, project feasibility documents etc. to estimate the investments required to build, operate & maintain each project		
7. Based on the outcome of the hydrological analysis estimate the impact (positive or negative) of development in others sectors on HEP. Describe in quantitative (i.e. monetary) & qualitative change	The hydrological analysis will indicate changes in the flow regime due to the infrastructure/water use developments assessed. This can change parameters pertaining to the use of water for power generation		
8. Incorporate comments from the RTWG, Project Coordination Team & MRCS programs	Comments will be collated & coordinated by the study coordinator		

Final Deliverable: Thematic report on Hydropower Development

Work Package 5: Domestic and Industrial Water Use Thematic Team

This work package will be covered by the Thematic Team working on Domestic and Industrial Water Use. The activities indicated here are for the team to assess the direct impacts, provide information required to assess the impacts via the hydrological cycle, compile the relevant thematic report and provide input for the cumulative report.

Activities	Notes	Intermediate Deliverables
1. Starting from BDP estimates & in collaboration with landuse mapping, map large existing & planned urban & industrial centers within the basin.	"Large" will be defined in discussion with the RTWG. BDP has estimated urban & industrial growth centers in the basin. Also use national sector plans.	Data for Hydrologic Modeling Team
2. Estimate water demand for each urban & industrial center over the study period	Estimate water that will be used from the river when other sources are not evident.	
3. Estimate general effluent & waste water discharge from each urban & industrial center based on similar urban & industrial centers in the region	use existing literature, project planning documents, etc.	
4. Highlight any possible risks of catastrophic events resulting from industrial spills		
5. Based on the outcome of the hydrological analysis estimate the impact (positive or negative) of development in others sectors on domestic & industrial water use. Describe in quantitative (i.e. monetary) & qualitative terms	The hydrological analysis will indicate changes in the flow regime due to the infrastructure/water use developments assessed. This can change parameters pertaining to the availability of water	

Final Deliverable:

Thematic Report on Domestic and Industrial Water Use

Work Package 6: Climatology and Hydrology – Hydrologic Thematic Team

This work package will be covered by the Hydrologic Discipline Team. The activities indicated here are for the team to use the data provided by the Thematic Teams, assess the changes to the hydrological regime, provide the information back to the relevant teams, compile a technical report and provide input for thematic reports and the cumulative report.

Activities	Notes	Intermediate Deliverables
1. Assess data, assumptions, methodologies used and results of hydrological modeling in key related studies including BDP Scenarios Assessment, Mainstream Dam SEA, & the World Bank study	Comment on whether the previous work can sufficiently meet the stated objectives of the Council Study (i.e. differentiated impact assessments etc.) and on the uncertainties and requirements for further clarifications, re-interpretation and/or data	Scoping Report of existing Hydrological Modeling in the basin
2. Update Basin Hydrological and Hydraulic models	Modeling activities conducted under WUP and the IBFM process should be updated using any recently generated data and/or information as needed	Updated Hydrological Model
3. Provide input to consolidate representative Eco Zones (relatively homogenous zones along the river) & representative sites in discussion with the other thematic & discipline teams	ISH has initiated this process of consolidating eco zones & representative sites for data collection & field surveys. The research done at the representative site will be extrapolated to the respective eco-zone	Consolidated list of river eco-zones & representative sites
4. Provide hydrologic input into a sediment model, or incorporate a sediment transport component into the hydrologic model	The approach and linkages to be defined following the Scoping phase.	Input to Sediment modeling
5. Estimates of naturalized long-term runoff for the baseline of 2010	Inputs include the undeveloped runoff sequences for sub-catchments, irrigation scheme and urban abstractions, in channel dams for irrigation water supply, run-of-river and storage based hydropower schemes.	Input for the biological resources and socio-economic assessment
6. Model expected future flow regimes associated with developments in each thematic area separately for each thematic area and cumulatively for developments in each thematic area		
7. Produce a continuous record of present day flows for each site over the study period. Produce simulated time series for the naturalized condition and for all chosen developments in each thematic area over the same period.		
8. Disaggregate the simulated monthly flow sequences to daily flow sequences, to delineate flow seasons (dry, wet and transition) for each year, and to calculate ecologically relevant flow statistics ("flow categories").	The environmental & social specialists will select flow characteristics that are of importance within their specialties (i.e. for habitat maintenance, acts as triggers, provides spawning/breeding refuge, provide migratory pathways etc.). The hydrologists will estimate changes in the flow characteristics due to developments	
9. Provide targeted input to other thematic areas to assess impacts & operating & development options	Assist the irrigation, hydropower & navigation thematic experts estimate the impact of sector developments on the flow regime & changes in the flow regime on the sector.	Input for the thematic teams
10. Develop a hydrological modeling technical report, disseminate for & incorporate comments		

Final Deliverables

1. Updated Basin-wide hydrology model
2. Hydrology Technical Report

Work Package 7: Sediment Transport - Hydrologic Thematic Team

This work package will be covered by the Hydrologic Discipline Team. The activities indicated here are for the team to use the data provided by the Thematic Teams to assess the changes in sediment transport, provide the information back to the relevant teams, compile a technical report and provide input for thematic reports and the cumulative report.

Activities	Notes	Intermediate Deliverables
1. Assess data, assumptions, methodologies used and results of sediment modelling in key related studies including BDP Scenarios Assessment, Mainstream Dam SEA, & the World Bank study (as per hydrologic ToR)	Special emphasis should be on comparing modelled results with recent sediment monitoring results from the LMB. This will allow evaluation of the model inputs and results with respect to the present (post-Chinese dam) flow and sediment scenario;	Scoping Report of existing sediment assessments in the basin
2. Select an appropriate sediment transport model for the Mekong in consultation with the hydrologic modelling group at the MRC and other modelling groups working in the region (Delta Study etc.) to derive the detailed time-series required by the Council Study.	This assessment should consider the available sediment data from the mainstream and tributaries (mass, grain-size, seasonal delivery patterns, sediment rating curves, present variability and rate of change), channel geometry and hydrologic information.	A sediment model updated or populated & calibrated
3. Calibrate and refine the model and design and interpret the results from sensitivity analyses to be incorporated in the sediment model runs;	the sediment expert must work closely and collaboratively with the modelling team with respect to parameterisation and calibration of the model;	
4. produce sediment time-series associated with each thematic area of the project. Identifying the likely changes to sediment availability and transport associated with each of the thematic areas	In collaboration with hydrologic modelling team	Input for the biological resources and socio-economic assessment
5. Estimates of naturalised long-term sediment transport and discharge at key sites in the LMB for the baseline of 2010	Inputs include the undeveloped runoff sequences for sub-catchments , irrigation scheme and urban abstractions, in channel dams for irrigation water supply, run-of-river and storage based hydropower schemes.	
6. Model expected sediment transport patterns and discharge associated with future flow regimes associated with developments in each thematic area separately for each thematic area and cumulatively for developments in each thematic area		
7. Disaggregate the simulated sediment transport sequences to finer time-steps to delineate sediment transport seasons (dry, wet and transition) for each year, and to calculate ecologically relevant sediment transport statistics, and relate these statistics to the relevant hydrologic statistics	The environmental & social specialists will select flow characteristics that are of importance within their specialties (i.e. for habitat maintenance, acts as triggers, provides spawning/breeding refuge, provide migratory pathways etc.). The hydrologists will estimate changes in the flow characteristics due to developments	
8. Provide targeted input to other thematic areas to assess impacts & operating & development options	Assist the irrigation, hydropower & navigation thematic experts estimate the impact of sector developments on sediment transport & changes in sediment on the sector.	Input for the thematic teams

Final Deliverables

1. Updated Basin-wide sediment transport model
2. Sediment Technical Report

Work Package 8: Fish & other aquatic/riparian Biological Resources Team

This work package will be covered by the Biological Resources Discipline Team. The activities indicated here are for the team to use the data provided by the hydrologic team to assess changes in biota, inform the socio-economic team and other relevant teams, compile a technical report and provide input for thematic reports and the cumulative report.

Activities	Notes	Intermediate Deliverables	
1. Assist in the literature search on Fish & other aquatic/riparian Biological Resources in the Basin	Based on an overall Council Study Lit review, compile relevant information from past and ongoing programs and research organizations		
2. Assess data, assumptions, methodologies used and results in the impact of development on fish & other aquatic/riparian Biological Resources in key related studies including BDP Scenarios Assessment, Mainstream Dam SEA, & the World Bank study	Comment on whether the previous work can sufficiently meet the stated objectives of the Council Study (i.e. differentiated impact assessments etc) and on the uncertainties and requirements for further clarifications, reinterpretation and/or data	Scoping Report of existing assessments of fish & other aquatic/riparian biological Resources	
3. Provide input to consolidate representative Hydro-Ecological Zones (relatively homogenous zones along the river) & representative sites in discussion with the other thematic & discipline teams	ISH has initiated this process of consolidating eco zones & representative sites for data collection & field surveys. The research done at the representative site will be extrapolated to the respective eco-zone	Consolidated list of river eco-zones & representative sites	
4. Develop a strategy for data collection & field surveys to fill gaps required to complete the tasks indicated in this TOR. Develop a budget & work plan for data collection & field surveys in consultation with study coordinator	Data collection methodologies and guidelines will be agreed to during the initial site visits.	A work-plan & budget for field surveys	A Field Report with data & information
5. In conjunction with Fisheries program & National Counterparts execute a work plan to collect data & conduct field surveys at representative sites.	Field surveys would cover seasonal variations, build upon & compliment ongoing activities & be primarily carried out by national institutions when possible		
6. Based on the best understanding, describe key flow indicators most important for selected Fish & other aquatic/riparian species/guilds at the representative sites.	At the selected sites, the fisheries experts will describe the flow events & conditions important to the select fish guilds (key flood events duration & size, drought events duration & size, water quality, etc). These will be modeled and described by the hydrologic team based on the impacts of the infrastructure/water use developments assessed	Data for Hydrological & Hydraulic modeling	
7. At representative sites describe sediment & river morphology indicators most important for selected fish & other aquatic/riparian species/guilds	The Fish & other aquatic animal experts will assess the representative sites to identify sediment river morphological characteristics most important for the selected guilds. This information will be conveyed to the hydrologic team. They will model the expected changes in these conditions	Data for Sediment Modeling	

8. At the representative sites describe aquatic plants & invertebrates indicators most important for selected Fish & other aquatic animal guilds	At the selected sites, the fisheries experts will describe the dependence of fish guilds on aquatic invertebrates & plants. The aquatic invertebrate & plant specialists will describe changes in these indicators.	Data for Aquatic Plants & Invertebrate experts
9. Select indicators to describe ecosystem fragmentation due to dams, flood plain, flood management and navigation infrastructure & flow changes.	Description of infrastructure & hydrological modeling of flow changes due to infrastructure can be used by the fisheries experts to describe impacts of changes on fish, other aquatic animals, Invertebrates & plants	Discussion material for thematic teams (HP, Nav, Infrastructure)
10. Analyze links better river flow& sediment indicators on aquatic plants & invertebrates at the representative sites.	Flow (quantity, timing, quality and sediment) indicators will be described by hydrology, water quality and sediment models. Describe the impact of these hydrology/sediment changes on the plants & invertebrates	
11. Describe links between the fish & other aquatic animal guilds & river flow, aquatic plant, & invertebrate indicators at selected sites. Describe the expected impacts of single driving indicators on the abundance of a single responding indicator	Changes in aquatic plants, invertebrates & flow conditions will have direct impacts on fish. Describe these expected changes on fish guilds.	
12. Analyze feedback links between harvest levels and selected indicators	This is to assess the direct and compounded impact of potential overfishing	
13. Describe link between changes in fish & other aquatic species/guilds & high priority avi and terrestrial fauna	Here the specialists will describe impact of changes in fish & other aquatic animals & plants on priority bird & other species. Social or ecologically important species	
14. Compile fish & other aquatic/riparian species/guilds response curves depicting the relationship between a driving indicator (either a flow indicator or a biophysical indicator) and a responding indicator	based on any available relevant knowledge & field studies, i.e., how the onset of the dry season affects fish guild A or how a change in the area of riffles affects fish guild A	
15. Incorporate completed response curves and develop draft final report indicating impact of selected developments on fisheries	Based on output of the knowledge capture work shop	
16. Assess changes in priority species in terms of livelihoods and community nutrition and develop report for socio-economics report	This activity feeds into the socio-economic assessment. Includes increases or decreases in abundance and variety	Information for Socio-economic Team

Final Deliverables

1. Technical Report Outlining Changes in Selected Environmental Parameters
2. Technical Input to the Thematic Teams to identify the Environmental Impacts of Water Resources Development within the Thematic Areas

Work Package 9: Socio-Economics Discipline Team

This work package will be covered by the Socio-Economics Discipline Team. The activities indicated here are for the team to use the data provided by all the other teams assess the positive and negative impacts on social indicators, compile a technical report and provide input for thematic reports and the cumulative report.

Activities	Notes	Intermediate Deliverables
1. Assess data, assumptions, methodologies used and results of socio-economic assessments in key related studies including BDP Scenarios Assessment, Mainstream Dam SEA, & the World Bank study	Comment on whether the previous work can sufficiently meets the stated objectives of the Council Study (i.e. differentiated impact assessments etc.) and on the uncertainties and requirements for further clarifications, reinterpretation and/or data	Scoping Report of existing Socio-economic assessments in the basin
2. Match ISH designated hydro-ecological zones with the Socio-Ecological Zones designated by the SIM/VA program.	The Council Study will assess the impact of flow changes at representative sites & consolidated zones along the river. Considering that the different MRC programs have different sites & zones, consolidated sites need to be selected to match key flow changes to socio-economic indicators via impact on biological resources	Consolidated list of river eco-zones & representative sites
3. Based on the SIM/VA surveys, work with the biological resources team to identify, categorize and guild fish, non-fish, & plants species of social importance	The biological resources team will categorize fish guilds, plant communities, invertebrates etc. to assess their response to imposed flow changes due to developments	Input to Biological resources team
4. Based on the best understanding, describe key flow indicators that can directly positively or negatively impact communities at the representative sites.	At the selected sites, the social experts will describe the flow events & conditions that directly positively or negatively impact communities (key flood events duration & size , drought events duration & size, water quality, etc.). These could be important due to flood recession agriculture, use of reeds etc. These will be modeled and described by the hydrologic team under the selected infrastructure/water use developments	Input to hydrologic team
5. At representative sites describe water quality indicators that can positively or negatively impact communities at the representative sites.	The Social experts will assess the representative sites to identify water quality indicators most important for communities based on use of river water for consumption, household use, aquaculture etc. This information will be conveyed to the hydrologic team. They will model the expected changes in these conditions.	
6. Based on the prediction of change in key priority species made by the biological team, predict changes in community access to & use of fish, non-fish & plant river resources	The biological resources team will predict the impact of flow changes on priority species used by communities at representative sites	Input to the Thematic teams for the preparation of thematic reports
7. Based on the predictions of change in key flow indicators made by the hydrologic team, predict changes in community wellbeing	this would include access to water for domestic & economic uses.	
8. Based on the reports produced by the thematic teams & hydrologic team & in collaboration with the economists estimate new livelihood opportunities arising from developments	Whereas macro-economists will estimate the economic benefits of development initiatives, new livelihood opportunities may arise due to the selected developments & their impacts	

<p>9. Based on assessments conducted & reports produced by the hydrologic modeling & biological resources teams provide input to the thematic teams on the positive & negative impacts of development on livelihoods, income, health & nutritional indicators.</p>		
<p>10. Assess the cumulative impact of developments and provide input to the preparation of a cumulative impacts reports</p>	<p>The coordination team will develop the cumulative impacts reports</p>	

Final Deliverables

1. Socio-economic technical report
2. Input to the Thematic and cumulative reports

Work Package 10: Macro-Economics

Considering the importance and complexity of accurately estimating the trans-boundary economic benefit and costs of water resources development especially in a dynamic economic environment, it is recommended that a scoping exercise is first carried out to develop a methodology and framework for a comprehensive assessment.

The methodology and framework will seek to clarify the following concerns;

1. For countries hosting developments:
 - a. The impact of the Hydropower construction phase on national GDPs,
 - b. Contribution of domestic and international hydropower sales to GDP, government revenue (taxes and dividends) and foreign exchange,
 - c. Contribution from export of agriculture products, manufacturing and/or navigational services to GDP, government revenue (taxes and dividends) and foreign exchange,
 - d. Multiplier effects of hydropower infrastructure development and the power sales in the national and regional economies including sustainability,
 - e. Multiplier effects of other developments including agriculture and manufacturing,
 - f. The possible effect of an increased debt burden from external sources and issues of debt sustainability and fiscal capacity constraint, including on access to financial resources for the countries,
 - g. The possibility of increased income from hydropower precipitating a decline in the manufacturing sector, especially agriculture sector and adversely impact broad-based economic development
2. For the importing countries:
 - a. The current and projected cost-effectiveness of hydropower compared to alternatives
 - b. The extent to which strategic issues (e.g. supply diversity, sovereign risk, geopolitics) drive these choices on source of supply and technology?
 - c. How will national plans to increase energy efficiency influence the relationship between domestic power generation and import strategies? What are likely scenarios for importers and exporters of hydropower?
 - d. Multiplier effects of hydropower infrastructure development and power sales in the regional economy including sustainability,
3. The CO₂ and global warming implications of developing and using hydropower - the implications in terms of global initiatives to limit carbon emissions.
4. The extent to which real cost (including externalities) are valued and included in the cost-benefit assessment.
5. The relative value of River Basin resources to each country.
6. Distribution of costs and benefits - incidence of benefits vs. costs amongst communities, livelihoods, countries and people of difference socio-economic strata.

In answering these and related questions, the following three-tiers of impacts will be assessed:

Tier One- Direct Costs Benefits - Investment and other direct costs of development of infrastructure and direct revenue from the sale of power and other revenue sources

Tier two- Indirect Costs and Benefits - Positive and negative economic externalities from development including ecosystem services and social impacts valued and internalized

Tier three- Multiplier Impacts - Multiplier effects of development s including impact on regional macro-economic development, trade flows etc.

These TOR is for a consultant to develop the framework.

Based on the aforementioned objectives, the expected outputs of the consultancy are:

3. A Scoping Report and a Literature Review:
 - a. Assessment of data, assumptions, and methodologies used for economic assessments conducted in key related studies - BDP Scenarios Assessment, Mainstream Dam SEA, & the World Bank study. Comment on whether the previous work can sufficiently meets the stated objectives of the Council Study (i.e. differentiated impact assessments etc) and on the uncertainties and requirements for further clarifications, reinterpretation and/or data
 - b. Guide and provide input to the Council Study Literature Review to identify relevant information including economic valuation studies and documentation, economic modeling activities etc.
 - c. Knowledge and experience from other river basins, particularly on the aspects identified as knowledge gaps for the Mekong River Basin
4. A clear framework and methodology for the assessment
 - a. A clear framework and methodology for the council study macro-economic analysis
 - b. priority list of data required for the assessment
5. A regional workshop to present and discuss the proposed methodology and outcomes
 - a. A workshop agenda
 - b. Presentation of outcomes of the literature review
 - c. Presentation and Discussion of critical questions
 - d. A report summarizing the main outcomes of the workshop including the identified critical questions.
 - e. A revised framework and methodology incorporating outcomes of the workshop
6. Outline Terms of Reference for a team of consultants and/or a research organization to Implement the framework and methodology for the assessment

Work Package 11: Flood protection structures, flood plain infrastructure, & Flood Risk Assessment Thematic Team

Activities	Notes	Intermediate Deliverables	
1. Map planned & existing flood protection structures & floodplain infrastructure projects throughout the basin & provide basic info on each project	This map will enable the RTWG to confirm the portfolio of projects to be assessed in the council study		
2. Provide detailed data & information for selected projects - geographical location & extent (i.e. of channel stabilization, dredging), phased development plans, design specifications, operational guidelines & practices.	Information required to assess hydro morphological changes to the river channel. Consult with hydraulic & hydrological modelers. River engineering measures that may impair the original hydro-morphological situation (e.g. bed-load transport, morpho-dynamic development of the channel network, the extent of change to exchange processes between rivers & floodplains, groundwater regime)	Data for Hydrological & Hydraulic modelling	Data for Sediment Modelling
3. Provide detailed data & information on possibility of decoupling of the river from floodplain habitats & any other issue that may have an environmental impact	Information required to assess impacts on the natural composition of ecological communities (e.g. through barriers for migratory fish species or destruction of riverbank & riverbed habitats & spawning places) & on ecologically important in-stream structures		Data for Biological resources team
4. Based on the outputs of the hydrologic team assess the increased or reduced flood risk over the Study time period due to the assessed water resources developments. Quantify risk in terms of social & economic indicators	Using information provided by the six thematic teams, the Hydrologic Team will assess the impact of developments in the six thematic areas on the flow regime of the Mekong River. A hydrological model will model the impact of abstractions, impoundments & any diversions on important flow indicators including the onset & recession of regular flood events. The hydrological modelers using information from the I& use change & agriculture team, will estimate significant changes in runoff due to I& use change patterns in the basin including transformation of forests to plantation, or agriculture & the emergence of urban developments. A hydraulic model will convert the surface flows to hydraulic conditions.	Input to the Soc-econ report	Input to the macro-econ report
5. Based on the outputs of the land-use change & agriculture team, estimate changes in flood risk due to the conversion of wetlands and floodplains to alternative land use categories	The landuse change & agriculture team will estimate land use/land cover change patterns over the study period describing development patterns & significant anthropogenic processes that affect the basin area. The outcome of this will be a map that can be used to assess changes in runoff & flood retention		

Final Deliverables: A Thematic Report on Flood protection structures and flood plain infrastructure,