TECHNICAL COOPERATION DOCUMENT

VALUATION OF THE BIOCLIMATIC SERVICES OF THE AMAZON FOREST

BR-T1269

I. Basic TC Information

▪ Country/Region:	Brazil
▪ TC Name:	Valuation of Bioclimatic Services of the Amazon Forest
▪ TC Number:	BR-T1269
▪ Associated Loan/Guarantee Name:	N/A
▪ Team Leader/Members:	Simone Bauch (CCS/CBR), Carlos Ludena (INE/CCS), Anne Gander (CCS/CBR), Cristina Marzo (LEG/SGO), Felipe Capella (LEG/SGO), Juan Carlos Gomez (INE/CCS), Fernanda Schukkel (CSC/CBR).
▪ Date of TC Abstract authorization:	10/16/2012
▪ Donors providing funding:	SECCI IDB Fund
▪ Beneficiary :	Brazilian Ministry of Science, Technology and Innovation
▪ Executing Agency and contact name	Inter-American Development Bank
▪ IDB Funding Requested:	US$210,000
▪ Local counterpart funding, if any:	US$52,500
▪ Disbursement period (which includes Execution period):	24 months
▪ Required start date:	February 2013
▪ Types of consultants (firm or individual consultants):	Consulting Firms
▪ Prepared by Unit:	INE/CCS
▪ Unit of Disbursement Responsibility:	INE
▪ TC Included in Country Strategy (y/n): ▪ TC included in CPD (y/n):	Y N
▪ GCI-9 Sector Priority:	Protection of the environment and Climate Change

II. Objectives and Justification of the TC

2.1 Bioclimatic services accruing from the Amazon are those provided by the rainforest biome that contribute to stabilize the global climate and maintain local climate. They include carbon stocks and flows, stability in rainfall patterns, stability of hydrological cycle and soil quality.

2.2 The bioclimatic services provided by the Amazon forest are believed to be extensive, but there is a lack of evidence of their dimension. It is also generally acknowledged that bioclimatic services occur in diverse areas and affect human welfare in multiple dimensions, yet the quantification for these different types of services is also missing. As the onset of

climate change will impact the provision of these services, it is important to quantify and analyze the size of this impact and how it might affect human welfare. This TC will support the estimation of bioclimatic services provided by the Amazon forest and the impact that climate change has on them. These estimates will be used to guide public policy regarding conservation of the Amazon forest and agricultural development in the region.

2.3 The general objective of this TC is to quantify the value of bioclimatic services of the Amazon forest to promote its debate among policy makers and researchers in Brazil. The specific objectives are:

a. Quantify and assess the economic impacts of deforestation in four (4) sectors or thematic areas: biodiversity, health, water, and agriculture.

b. Develop a model to estimate direct and indirect costs of deforestation, which account for the leakage and interaction between sector impacts and factors of production to estimate the overall value of deforestation. This model will include different climate change scenarios that will be assessed.

c. Engage policy makers and researchers through the dissemination of the knowledge generated.

2.4 Given that this TC is directly linked to climate change mitigation and adaptation, it is aligned with the GCI-9 fifth lending target related to climate change[1]. This project is also aligned with the Brazil Country Strategy for 2012-2014 (document GN-2662-1), as it contributes to the priority that focuses on increasing the sustainable management of natural resources and climate change mitigation and adaptation actions.

III. Description of activities/components and budget

3.1 Valuation of bioclimatic services is a very broad field with little existing information available. The proposed analysis is intended as a preliminary research tool on the value of bioclimatic services in the Amazon. Although an exhaustive research will not be performed, the operation intends to link forests to economic values. The project team proposes to enhance the current available knowledge through the execution of the following three components:

3.2 **Component 1: Sector estimates:** This component will analyze the impacts (measured in currency units) of deforestation in four (4) sector or thematic areas. These include:

a. Biodiversity: the costs of biodiversity loss;

b. Water: consequences of deforestation on the water cycle, erosion, water quality and related water services;

c. Health: impact of deforestation on human health due to vector borne diseases and air quality;

d. Agriculture: economic impact of deforestation on land use and forestry;

The expected outputs of each of the sector studies are working papers. The majority of these products from this component are expected to be delivered during the first year of the execution of the TC.

[1] "Protect the environment, respond to climate change, promote renewable energy and ensure food security"

3.3 Related to climate change, the project team intends to explore the effects of CO_2 fertilization on the Amazon. A major question related to the effects of climate change on tropical forests is the effect of CO_2 fertilization. The simplified hypothesis is that, as CO_2 concentration in the atmosphere increases, plants would grow more and consequently absorb more CO_2 in the process, cancelling the adverse effect of climate change. While some experiments have been carried out in temperate forests, the effect on tropical forests is still an open question. We will organize a workshop with leading scientists in the field to debate this scientific. The results will complement this operation's modeling component (component 2) during the first year of execution of the TC.

3.4 **Component 2: Compilation study:** While it is common to carry out point estimates to value a given ecosystem service that is lost due to alternative uses, it is rare to compile these estimates and make them comparable. This TC will combine sector studies from component 1 into a single model, which will facilitate the task of adding them up and, therefore, arriving at an overall estimate for the valuation of deforestation. We will use methodologies[2] that take into account both direct and indirect costs and consolidate in a single estimate the overall impacts of deforestation. The anticipated output of this component is a working paper, which is expected to be delivered during the second year of the TC.

3.5 **Component 3: Outreach and dissemination:** Most academic research receives limited interest from the general public because it is not well publicized. To enhance the understanding and uptake of the estimates produced, this component includes a workshop and related dissemination events to promote a discussion about the costs of deforestation among experts and the general public. This TC will also disseminate the results of the studies produced by organizing a special session in an international conference.

Indicative Results Matrix

Indicator	Unit	Baseline		Year 1		Expected Completion Date	Data Source
		Value	Year	Planned	Actual		
Number of times knowledge produced has contributed to projects, strategies of the Bank or it has been referred in publications	#	0	2012	2		2015	Country strategies, bank projects,
Working papers (sector studies)	#	0	2012	5		2013	IDB Website
Discussion Workshop on CO_2 forest fertilization	#	0	2012	1		2013	Opus and IDB Website
Working paper (compilation study)	#	0	2012	1		2014	IDB Website
Workshops and presentations in conferences	#	0	2012	2		2014	Opus and IDB Website
Positive feedback of experts in workshops	%	0	2012	50%		2014	Participant surveys

[2] We intend to follow existing literature in using general equilibrium models coupled with econometric analyses as in Pattanayak et al (2009) and Golub et al (2009).

3.6 This TC will finance technical studies and dissemination workshops and events. As such, the procurement plan is divided into consulting services (US$140,000), workshop logistics and travel costs (US$70,000). The local counterpart for this TC will be a total of USD$52,500 in-kind contribution (man hours), provided by the Ministry of Science, Technology and Innovation of Brazil in their support to organize the workshop on CO_2 fertilization, as well as the review of the sector studies.

Indicative Budget

Component	Description	Type of cost	IDB funding (USD $)	Counterpart funding (USD $)	Total funding (USD $)
1. Sector estimates	Four (4) sector studies	Individual consultants or firm	100,000	40,000	140,000
	Workshop on CO_2 fertilization	Event	30,000	12,500	42,500
2. Overall valuation estimated	One (1) compilation study	Individual consultants or firm	40,000		40,000
3. Outreach and dissemination	Dissemination workshop and conference participation	Event	40,000		40,000
TOTAL			210,000	52,500	262,500

3.7 Funding from IDB is required as other sources of funding are not available for the work to be carried out. This is the case, as novel studies that integrate multiple dimensions and integrate climate and deforestation are not financeable with other usual sources of climate funding.

3.8 The Climate Change and Sustainability Division Specialist responsible for execution of the operation is Simone Bauch (CCS/CBR), with the support of Carlos Ludeña (INE/CCS) in HQ. As such, the Brazil's Country Office (CCS/CBR) will have the principal technical and fiduciary responsibility. The IDB procurement policies will apply to this TC.

3.9 There will be supervision costs to the COF. The Specialists involved in the execution of this TC will travel to the events related to its execution and the results dissemination. Specifically, one workshop will take place in Brasilia (component 3), one in Washington D.C. (CO_2 fertilization workshop –component 1) and the participation in an international conference (under component 3) outside Brazil.

3.10 The consultants (firms/individuals) will deliver reports according to an agreed timeline. No intermediate evaluation reports will be delivered; a final report will be prepared by the consulting team. The monitoring of the consultants (firm/individuals) will be done through a direct and regular supervision, carried out at least monthly by the team leader.

IV. Executing agency and execution structure

4.1 The Bank will execute this TC upon request by the Brazilian Ministry of Science, Technology and Innovation. This arrangement is convenient given the Bank's considerable expertise in projects about issues related to mitigating climate change through land use and land use

change initiatives, and it is better positioned to conduct a prompt selection and the hiring process of high quality consulting services.

V. Major issues

5.1 As this TC will be executed directly by the Bank, the risks associated to it are low. Given that the work under this TC is highly technical, the main risk asociated to the execution of this operation relates to recieving products which quality does not meet the Bank's standards, if the the consultants' work is not monitored closely and adequately by the project team. This risk will be mitigated by the peer review process (by INE and INE/CCS) and the close supervision of the activities by CCS, as described in section III.

VI. Exceptions to Bank policy

6.1 There are no exceptions to Bank policy.

VII. Environmental and Social Strategy

7.1 In accordance with the Environmental and Social Compliance (OP-703) and the Safeguard Classification Toolkit, this project has been classified as Category "C". The activities financed through this operation will not have direct or indirect, social or environmental negative impacts.

VIII. Annexes:

- **Annex I:** Letter of Request from the Brazilian Ministry of Science, Technology and Innovation.
- **Annex II:** Terms of reference for the consultants under each component.
- **Annex III:** Procurement Plan.

Proton - 031761/2012

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO
Secretaria de Políticas e Programas de Pesquisa e Desenvolvimento
Esplanada dos Ministérios – Bloco E – 2º andar – Sala 218
CEP: 70.067-900 – Brasília – DF – Tel.: (61) 2033-8128/ 8015 – Fax.: (61) 2033-7766

Ofício n.º 117/2012/SEPED/MCTI

Brasília, 06 de Agosto de 2012.

A Sua Senhoria a Senhora
DANIELA CARRERA-MARQUIS
Representante no Brasil
Banco Interamericano de Desenvolvimento - BID
Setor de Embaixadas Norte
Quadra 802 Conj. F lote 39 – Asa Norte
Cep: 70800-400 – Brasília - DF

Assunto: **Proposição de Cooperação técnica com o BID – Valoração de Serviços Bioclimáticos da Floresta Amazônica.**

Senhora Representante,

1. O Ministério de Ciência, Tecnologia e Inovação vem por meio desta pedir o apoio do BID para uma cooperação técnica a ser desenvolvida com o objetivo de apoiar a estimativa do valor de serviços Bioclimáticos da floresta Amazônica.
2. Esta cooperação técnica apoiará o desenvolvimento de pesquisa para elucidar os valores monetários e não monetários se serviços bioclimáticos, tais como provisão e regulação hídrica, controle de vetores de doenças, biodiversidade, armazenamento de carbono, e como a provisão destes serviços será afetada pelas mudanças climáticas.
3. Estimamos que a cooperação técnica entre as duas instituições envolva execução das seguintes atividades:
    1. Apoio ao desenvolvimento de estimativas de valor para cada serviço bioclimático mencionado acima.
    2. Utilização de modelo para capturar interação e complementariedade entre os serviços bioclimáticos.
    3. Apoio à realização de workshop para discussão de experimento de campo sobre o efeito de "fertilização" de CO_2 na Amazônia.

4. Vemos com muito interesse a possibilidade de uma cooperação de longo prazo com o BID em seguimento ao resultado dos estudos.

Atenciosamente,

CARLOS A. NOBRE
Secretário de Políticas e Programas de Pesquisa e Desenvolvimento

GFN2012

CLIMATE CHANGE AND SUSTAINABILITY DIVISION (INE/CCS)

VALUATION OF BIOCLIMATIC SERVICES OF THE AMAZON FOREST - BR-T1269

CONSULTING FIRM – VALUATION OF BIOCLIMATIC SERVICES OF THE AMAZON FOREST

TERMS OF REFERENCE

I. BACKGROUND

1.1 The bioclimatic services provided by the Amazon forest are believed to be extensive, but there is a lack of evidence of their dimension. It is also generally acknowledged that bioclimatic services occur in diverse areas and affect human welfare in multiple dimensions, yet the quantification for these different types of services is also missing. As the onset of climate change will impact the provision of these services, it is important to quantify and analyze the size of this impact and how it might affect human welfare.

1.2 At the request of the Ministry of Science, Technology and Innovation of Brazil, the Inter-American Development Bank (IDB) will assist in the estimation of bioclimatic services provided by the Amazon forest and the impact of climate change has on them. These estimates will be used to guide public policy regarding conservation of the Amazon forest and agricultural development in the region.

II. OBJECTIVE OF THE CONSULTANCY

2.1 The objective of this Consultancy is to assist the Climate Change and Sustainability Division (INE/CCS) to quantify the value of bioclimatic services of the Amazon in Brazil. This quantification will involve both sector studies as well as one integrated model with multiple sectors. The overall objective is to estimate the value of these services for the region.

2.2 The specific objectives are:

a. Quantify and valuate impacts due to deforestation for four (4) sectors. These are: a) Biodiversity; b) Health; c) Water; and d) Agriculture

b. Develop a model to estimate direct and indirect costs of deforestation, accounting for leakage and interaction between sector impacts and factors of production to estimate the overall value of deforestation. This model should integrate the sectors cited above.

III. MAIN ACTIVITIES

3.1 The selected consultant is expected to carry out the following activities:

a. Identify and summarize available information (study and literatures) regarding:

i. The value of biodiversity in tropical forests estimates and how deforestation affects them;

ii. How human health is affected by deforestation (focusing on illnesses and vector borne diseases);

iii. The value of water services (e.g. use, quality, hydroelectric power provision) and how they are affected by deforestation;

iv. The value of agricultural services provided by tropical forests (i.e. pollination) and the opportunity cost associated to competing land uses;

v. How climate change affects tropical deforestation and the services described above.

b. Collect and/or generate information to be used for the analyses, including a complete explanation of variable included (i.e. description, source, year, unit). Also:

i. Panel dataset including variables such as, but not limited to, measures of outcome variables, deforestation, socioeconomic and demographic covariates, institutional covariates, instrumental variables (if needed), biological and climatic controls, etc.

ii. Panel should cover at least 5 time periods.

iii. Dataset of at least 1,000 observations, where the unit of observation should be at least the municipality;

c. Estimate separate quantitative econometric models for each of the four sectors (biodiversity, human health, water, agriculture) to assess the impact of deforestation on their value. The results of each model should be comparable. This means that ideally the dataset used for the estimation should produce equivalent results (may not include the same variables but included variables would have the same units for example).

d. Using a model that captures the general equilibrium effects (a Computable General Equilibrium Model (CGE) is preferred) of the effects estimated by the sector studies, estimate the impacts of deforestation on the general economy. The model and database should preferably be focused on Brazil, but could also be a global database that is linked to a model for Brazil. The model should allow have sectoral detail that allows for the implementation of sectoral impacts based on results numeral (c). A dynamic CGE that incorporates climate projections is desirable.

e. Identify policies implications, and formulate policies and institutional arrangements to reduce the negative impacts based on the results from numerals (c) and (d).

IV. PRODUCTS/DELIVERABLES

4.1 The anticipated deliverable for this consultancy is a document that quantifies the value of bioclimatic services of the Amazon in Brazil. As a result of the activities described in section III, the consultant will deliver the following products1.

4.2 Product 1: Inception report which should include the work plan and detailed time table for the development of the consultancy and product delivery.

4.3 Product 2: Preliminary report with detailed methodological approach to be used in the analyses together with a justification and explanation of how information and data will be obtained.

4.4 Product 3: Individual Sector reports. These reports should not exceed 40 pages each and should be written in the form of a scientific article.

4.5 Product 4: CGE report. This report should not exceed 40 pages each and should be written in the form of a scientific article. It should present results of the CGE model as well as main assumptions to arrive at these results.

4.6 Product 5: Final technical report. This report should not exceed 40 pages and should include the compilation of the sector and CGE results. As annexes (beyond page count), the report should include the complete database(s) used in the analysis, as well as the revised sector and CGE reports.

4.7 Product 6: Policy report. Based on product 5, the consultant will develop a policy report targeted towards policy makers. The language of this report should be understandable by non-technical professionals. This report should not exceed 15 pages.

4.8 The Consultant will also be required to share and discuss their findings publicly in Brazil. This may include presentations, discussions at universities, and workshops with relevant political and academic figures. These activities will be performed in coordination with the Bank and the Government of Brazil at all times.

4.9 The outputs of the consultancy as well as reports must follow the Bank protocol regarding to publication. The reports will be prepared and delivered in English.

4.10 The dates established to submit the reports might vary previous justification and approval by the Bank.

V. PAYMENT SCHEDULE

5.1 The consultancy will receive the associated payments in the following schedule:

a. 20% on the signature of the contract and delivery and approval by the Bank of the inception report (product 1). The inception report should be submitted within 15 calendar days from the signature of the contract.

[1] The report(s) should be presented to the Bank in electronic form in one file (PDF format and Microsoft Office). The document must contained cover, main document and annexes. (No zip file will be received as a final report, according to the regulation in the Records administrative Section)

b. 20% on the delivery, and approval by the Bank of product 2. The Preliminary report should be submitted with three (3) months from the signature of the contract.

c. 30% on the delivery, and approval by the Bank of products 3 and 4. The Individual sector reports and the CGE report should be submitted within six (6) months from the signature of the contract.

d. 30% on the delivery, and approval by the Bank of reports 5 and 6. The final report and policy report should be delivered within twelve (12) months from the signature of the contract.

VI. COORDINATION

6.1 The consultant will be under the coordination and supervision of the Project Team Leader, Mrs. Simone Carolina Bauch (sbauch@iadb.org) (CCS/CBR), and co-team leader, Mr. Carlos Ludena (INE/CCS) (carlosl@iadb.org).

VII. CHARACTERISTICS OF THE CONTRACT

7.1 Type of consultancy: Consulting Firm or Organization of one of the IDB's member countries

7.2 Contract Duration: Twelve months (12) from the day the contract is signed, from May 2013 to May 2014.

7.3 Post of Duty: Firm's headquarters with two trips, one to Brazil and one to USA to present results.

7.4 Payments: Refer to Section V of this document.

7.5 Requirement and Qualifications: The consultant firm or organization should have extensive experience and expertise on:

a. Work experience on a range of issues associated with environment and natural resources issues, including deforestation, ecosystem services, and valuation of ecosystem services.

b. Technical team with experience on economic modeling and estimation. Demonstrated and strong capacity in quantitative methods and tools.

c. At least two team members should have fluent Portuguese to assure access to data websites and to enable presentations to the Brazilian government.

7.6 The consultant team should have at least the following experience:

a. Project coordinator:

i. The consultant's team should be led by a professional with a PhD in economics or applied economics, with at least 15 years of post-graduate research experience.

ii. Significant experience on deforestation, ecosystem services, and valuation of ecosystem services.

iii. At least 10 papers published in high ranking peer reviewed journals.

b. Biodiversity specialist

    i. Masters (PhD preferred) in economics or related field, extensive econometric knowledge and at least 3 years' experience in research on econometrics, biodiversity, natural resources or related fields.

c. Health specialist

    i. Masters (PhD preferred) in health economics or related field, extensive econometric knowledge and at least 3 years' experience in research on econometrics, tropical diseases or related fields.

d. Water specialist

    i. Masters (PhD preferred) in economics or related field, extensive econometric knowledge and at least 3 years' experience in research on econometrics, water services or related fields.

e. Agriculture specialist

    i. Masters (PhD preferred) in agricultural economics or related field, extensive econometric knowledge and at least 3 years' experience in research on econometrics, agriculture or related fields.

f. Climate Change specialist

    i. Professional with a PhD in climate science or related field with experience in climate modeling at the regional level (i.e. in models that can provide information for Brazil).

PROCUREMENT PLAN FOR NON-REIMBURSABLE TECHNICAL COOPERATIONS										
Country: Brazil				**Executing agency: IDB**						**Public or private sector: Public**
Project number: BR-T1269				**Title of Project: Valuation of Bioclimatic Services of the Amazon Forest**						
Period covered by the plan: January 2012 - December 2014										
Threshold for ex post review of procurements: N/A				**Goods and services (in US$):**			**Consulting services(in US$):**	210,000		
Item No.	**Ref. AWP**	**Description (1)**	**Estimated contract cost (US$)**	**Procurement Method (2)**	**Review of procurement (ex ante or ex-post) (3)**	**Source of financing and percentage**		**Estimated date of the procurement notice or start of the contract**	**Technical review by the PTL (4)**	**Comments**
						IDB/MIF %	**Local/other %**			
1		**Component 1**	**130,000**							
		Non consulting services								
		Workshop Logistics and Travel	30,000	**PC**		**100**				
		Consulting services								
		Consulting Firm	100,000	**QBS**	**Ex Post**	**100**		**Apr-13**		
2		**Component 2**	**40,000**							
		Consulting Services								
		One (1) compilation study	40,000							
3		**Project Execution Unit**	**40,000**							
		Event								
		Dissemination Workshop	40,000							
Total			**210,000**	**Prepared by: Simone Bauch**			**Date: 12/03/2012**			

(1) Grouping together of similar procurement is recommended, such as computer hardware, publications, travel, etc. If there are a number of similar individual contracts to be executed at different times, they can be grouped together under a single heading, with an explanation in the comments column indicating the average individual amount and the period during which the contract would be executed. For example: an export promotion project that includes travel to participate in fairs would have an item called "airfare for fairs", an estimated total value od US$5,000, and an explanation in the Comments column: "This is for approximately four different airfares to participate in fairs in the region in years X and X1".

(2) **Goods and works:** CB: Competitive bidding; PC: Price comparison; DC: Direct contracting.

(2) **Consulting firms:** CQS: Selection Based on the Consultants' Qualifications; QCBS: Quality and cost-based selection; LCS: Least Cost Selection; FBS: Selection under a Fixed Budget; SSS: Single Source Selection; QBS: Quality Based selection.

(2) **Individual consultants:** IICQ: International Individual Consultant Selection Based on Qualifications; SSS: Single Source Selection.

(3) **Ex ante/ex post review:** In general, depending on the institutional capacity and level of risk associated with the procurement, ex post review is the standard modality. Ex ante review can be specified for critical or complex process.

(4) **Technical review**: The PTL will use this column to define those procurement he/she considers "critical"or "complex"that require ex ante review of the terms of reference, technical specifications, reports, outputs, or other items.