



1. Project Data

Project ID P143185	Project Name BR-FIP: Cerrado Monitoring Systems	
Country Brazil	Practice Area(Lead) Environment, Natural Resources & the Blue Economy	
L/C/TF Number(s) TF-A1787	Closing Date (Original) 29-May-2020	Total Project Cost (USD) 9,149,320.30
Bank Approval Date 28-Mar-2016	Closing Date (Actual) 29-Dec-2021	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	9,250,000.00	9,250,000.00
Revised Commitment	9,149,320.30	9,149,320.30
Actual	9,149,320.30	9,149,320.30

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2. Project Objectives and Components

a. Objectives

The objective of the project was to enhance the Member Country's institutional capacity in monitoring deforestation, in providing information on fire risks, and in estimating related GHG emissions in the Cerrado (PAD, para 27). The "Member Country" refers to the Federative Republic of Brazil in the context of the World Bank Group's global partnership (PAD, footnote 17, page 13).

The following three objectives are assessed in this ICRR:



1. Enhance the Member Country's institutional capacity in monitoring deforestation in the Cerrado
2. Enhance the Member Country's institutional capacity in providing information on fire risks in the Cerrado
3. Enhance the Member Country's institutional capacity in estimating related GHG emissions in the Cerrado

b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

Component 1: Deforestation monitoring (Estimate: US\$ 4.39 million, Actual: US\$ 4.39 million) financed:

a) designing and implementing a deforestation monitoring system for the Cerrado, including annual deforestation mapping and near real-time deforestation detection based on the PRODES and DETER systems; b) training to selected stakeholders on access, interpretation and use of the information generated by the Cerrado deforestation monitoring system; and c) designing and implementing a data quality control system for the Cerrado deforestation monitoring system.

Component 2: Information systems on forest fire risk and GHG emissions estimation (Estimate: US\$ 3.31million, Actual: US\$ 3.31million) financed: a) improving INPE's fire risk information system by designing, implementing, and providing, inter alia, (i) localized fire risk warning barometers, (ii) applications for interactive fire risk updates, (iii) higher fire risk resolution maps, (iv) instruments for fire risk statistical analysis, and (v) automatic status updates; b) adapting a fire ignition, spread and carbon model to the Cerrado, including the integration of daily-updated, on-line fire spread forecast information on INPE's Queimadas website, and applying such model in selected conservation units as a fire management tool; c) adapting INPE's GHG emissions estimation system to the Cerrado; and d) hands-on training on the practical application of fire risk modelling tools to selected stakeholders.

Component 3: Project management, monitoring, and evaluation (Estimate: US\$ 1.55 million, Actual: US\$ 1.55 million) provided support for managing the technical and administrative aspects of the Project, including financial management, procurement, annual audits, overall project coordination, monitoring, and evaluation of project implementation.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: At appraisal, the project was estimated to cost US\$9.25 million (PAD, para 31). At project closing, the actual cost was US\$9.25 million (ICR, page 45).

Financing: As envisioned at appraisal (PAD, para 31), the project was fully financed by a grant from the Strategic Climate Fund (ICR, para 29).

Dates: The project was approved on March 28 2016, and became effective on June 22 2016. The Mid-Term Review was concluded in May 2019 (based on additional information provided through a meeting with



the last TTL of the project, hereafter, TTL meeting). The project was closed on December 29, 2021, which was a year and seven months after the original closing date of May 29, 2020.

Restructuring: The project conducted two restructurings on August 1, 2019 and November 4, 2020. At the first restructuring, the results framework (the theory of change diagram and three intermediate results indicators) were revised to better capture the project results. In addition, the project closing date was extended for ten months to: (i) compensate for initial delays due to the implementing agency's unfamiliarity of the World Bank's guidelines and procedures and the insufficient human resources; and (ii) develop another annual deforestation map for the Cerrado (covering the year 2019-2020) to inform the other two FIP Projects under implementation (ICR, para 37). At the second restructuring, the project closing date was further extended for nine months due to restrictions on field visits and face-to-face meetings under the COVID-19 outbreak (ICR, para 38).

3. Relevance of Objectives

Rationale

Country and Sector Context: The Cerrado biome, located in the Brazilian Central Plateau south of the Amazon region, covers almost one quarter of the country's territory, or approximately 200 million hectares, providing a home to 5 percent of all biodiversity on the planet (ICR, para 10). To a large extent, Brazil's agricultural growth occurred over the last decade in the Cerrado biome (PAD, para 2). The expansion of agriculture in the Cerrado caused deforestation and use of fire, resulting in not only degradation of biodiversity, soil, and pasture and changes to water and sedimentation regimes, but also in large carbon emissions and methane releases from cattle ranching (ICR, para 11). Land-use data indicated that only 54.5 percent of the Cerrado biome maintained its natural vegetation (ICR, para 11). Considering that much of the land in the Cerrado was available for legal deforestation and considered as having high agricultural potential, it was expected that agricultural activities would keep increasing in the region for some time (PAD, para 17). Given challenges in the Cerrado, the Brazil Investment Plan (BIP) was approved in May 2012 under the Forest Investment Program managed by the World Bank (PAD, para 18). The BIP aimed to promote sustainable land use and forest management in the Cerrado biome, contributing to reducing pressure on the remaining forests, reducing GHG emissions, and increasing carbon dioxide (CO₂) sequestration (PAD, para 18). This project was designed as a part of BIP to implement an early-warning system for preventing forest fires and a system for monitoring the vegetation cover under Theme 2 (Production and Management of Forest Information) (PAD, annex 5, page 49). The Results Framework of the project was designed to be integrated at the BIP level, contributing to the annual reporting requirements under the FIP (PAD, annex 5, page 49).

Relevance to Government Strategies: At appraisal and at project closing, the objectives were in line with the National Policy on Climate Change (Law No. 12.187/2009) and the Nationally Determined Contribution to reduce greenhouse gas (GHG) emissions submitted during the Paris Climate Conference in 2016 (ICR, para 42). The objectives were also in line with the Action Plan to Prevent and Control Deforestation and Fires in the Cerrado Biome (PPCerrado) launched in September 2010 with aims to promote sustained reduction in the rate of deforestation and forest degradation (including fires) in the biome by improving monitoring and control capabilities of federal agencies, while promoting the regularization of rural properties, sustainable production activities, and the restoration of degraded lands (PAD, para 16).



Relevance to Bank Assistance Strategies: At appraisal, the objectives aligned with the Country Partnership Strategy (CPS) FY2012-2015, particularly with Strategic Objective 4 (Improving sustainable natural resource management and climate resilience), which aimed to enhancing the World Bank’s Amazon Initiative approach of combining conservation with development and employment opportunities to cover the Cerrado savannah region (CPS, para 69). At project closing, the objectives aligned with the Country Partnership Framework (CPF) FY18-FY23, which aimed to resolve conflicts over land and natural resources, especially in Brazil’s Amazon and Cerrado biomes in Objective 3.1 (Support the achievement of Brazil’s NDC with a particular focus on land use) under Focus Area 3 (Inclusive and sustainable development) (CPF, para 99).

Bank Experience in the Sector: This project was complementary to another two World Bank projects financed under BIP, namely, FIP: Environmental Regularization of Rural Lands in the Cerrado of Brazil (P143334, FY16); and Sustainable Production in Areas Previously Converted to Agricultural Production (P143184, FY15) (PAD, annex 5, table 7, page 48). The project results were expected to also inform the later World Bank projects financed under BIP, namely, the Dedicated Grant Mechanism for Indigenous People and Traditional Communities (P143492, FY15); the Integrated Landscape Management in the Cerrado Biome (P164602, FY19); and the Brazil Investment Plan Coordination (P152285, FY18) (ICR, footnote 3, page 6).

The objectives were in line with the strategies of the government and the World Bank’s assistance at appraisal and project closing. This project complemented other projects financed by BIP. On the other hand, the relevance of the objectives was pitched at a level that did not adequately reflect a potential solution to development challenges of unsustainable land use, deforestation and forest degradation, and GHG emissions in the Cerrado biome. While acknowledging the difficulty of the operational environment, a shortcoming here was that the PDO formulation to "enhance the Member Country’s institutional capacity in monitoring deforestation, in providing information on fire risks, and in estimating related GHG emissions in the Cerrado" was not outcome focused and did not help in understanding what development results were expected as a consequence of the project. The expected results were described in the PAD (para 18) as the objective of the BIP program (“to promote sustainable land use and forest management in the Cerrado biome, contributing to reducing pressure on the remaining forests, reducing GHG emissions, and increasing carbon dioxide (CO2) sequestration”) that the project was part of, but they were not reflected in the PDO formulation. These might be longer term targets but tracking them and identifying them was an important aspect of a successful development operation. The relevance of objectives, therefore, is rated substantial.

Rating

Substantial

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

Enhance the Member Country’s institutional capacity in monitoring deforestation in the Cerrado



Rationale

Theory of Change (TOC): The PDO statement focused on outputs, as described in section 3, resulting in insufficient articulation of expected outcomes of objective 1. According to information in the ICR (figure 1, page 12) and the PAD (annex 5, page 49), the TOC of objective 1 targeted the national and subnational level government institutions. The TOC postulated that monitoring deforestation by satellite and a national real-time deforestation detection system, publishing the deforestation through a web portal, and providing training to the government institutions to utilize the deforestation information would result in outputs including the publication of the deforestation information, contributing to an outcome of sustainable land use and forest management in the Cerrado biome promoted. In the long-term, the outcome was envisioned to contribute to improved land use planning and management, pressures on the remaining forests reduced, GHG emissions reduced, and carbon dioxide (CO₂) sequestration increased.

Critical assumptions included: (i) there was adequate institutional capacity and experience in monitoring deforestation; (ii) information systems developed by leading specialized government agencies would improve use of government resources and service delivery; (iii) the deforestation information would be incorporated into daily operations improve coordination and law enforcement; and (iv) relevant stakeholders would participate in the training.

Outputs (ICR, paras 44-62 and Annex 1):

- 9 annual deforestation maps on the scale of 1:250,000 were publicly available (PRODES-Cerrado), exceeding the revised target of 5 annual deforestation maps. In addition to the data collected during project implementation, the data kept from years prior to appraisal was used to create the annual deforestation maps (TTL meeting).
- Deforestation data on the scale of 1:500,000 was delivered to the public (DETER-Cerrado), achieving the original target.
- 31 government institutions were provided with capacity building to improve management of forest resources, doubling the original target of 15 government institutions.
- 88.89 percent of users satisfied with data provided by the project, exceeding the original target of 65.00 percent.

Outcomes (ICR, paras 44-62 and Annex 1):

- Information on deforestation in the Cerrado was regularly made available to the public and to relevant institutions, achieving the original target. Though this indicator was designed as a PDO indicator, it measured the output-level results because this indicator did not measure anything beyond achievements of the two Intermediate Results indicators (publishing annual deforestation maps through PRODES and publishing deforestation data through DETER) (ICR, page 35).
- 21 government institutions, which were in charge of policy, deforestation control, and fire prevention, were using the information on deforestation and fire risk in the Cerrado at project closing, exceeding the original target of 15 government institutions. Both national and subnational level institutions were using the information provided by the project (ICR, page 36). On the other hand, no evidence was provided regarding how the information on deforestation was used and whether the information was used to promote sustainable land use and forest management in the Cerrado biome.



In addition to the outcome defined in the Results Framework, the ICR reported on the following achieved outcome which did not have any formal target.

- According to the external evaluation of the project conducted in 2021, 100 percent of beneficiary agencies' interviewees recognized that the project contributed to institutional strengthening, while 79 percent of managers in the beneficiary institutions recognized the availability of almost real time and improved quality information and of the systems to enable them to access the information (ICR, para 63).

In summary, information on deforestation was regularly published and used by the relevant government institutions, where the managers were generally aware of the availability of the good quality and nearly spontaneous information and the system through which they can access it. Two PDO targets were met or exceeded. On the other hand, one of the PDO indicators did not provide evidence on outcome-level results. Referring to the TOC above, no evidence was provided regarding to what extent the achieved PDO targets contributed to promoting sustainable land use and forest management in the Cerrado biome, which was the objective of the Brazil Investment Plan. The achievement of objective 1, therefore, is rated substantial but marginally due to limited evidence to support the credibility of critical assumption (iii). More detail on the application of the relevant data and information would have provided a more complete picture of how effective the project had been.

Rating

Substantial

OBJECTIVE 2

Objective

Enhance the Member Country's institutional capacity in providing information on fire risks in the Cerrado

Rationale

Theory of Change (TOC): The PDO statement focused on outputs, as described in section 3, resulting in insufficient articulation of expected outcomes of objective 2. According to information in the ICR (figure 1, page 12) and the PAD (annex 5, page 49), the TOC of objective 2 targeted the national and subnational level government institutions and envisioned that improving the fire risk information system, developing the fire ignition spread and carbon (FISC) model for the Cerrado biome, and providing training to the relevant government institutions on the forest fire risk would result in outputs including the information on fire risk hazard made available to the public, the information on the risk of fire spreading in the Cerrado made available to the public and selected UCs, and the estimate of GHG emissions in the Cerrado made available to the public, contributing to an outcome of improved production and dissemination of biome-scale environmental information. In the long-term, the outcome was envisioned to contribute to improved land use planning and management in Brazil.

Critical assumptions included: (i) the national space research institute and universities would collaborate with the project to improve the fire risk and fire spread information systems; (ii) the government institutions would utilize the modern modelling approaches and the data on fire risk, fire spread, and GHG emissions



provided under the project; (iii) the deforestation information would be incorporated into daily operations improve coordination and law enforcement; and (iv) relevant stakeholders would participate in the training.

Outputs (ICR, paras 44-62 and Annex 1):

- 63 new fire risk information products were available to users on interactive communication devices, exceeding the original target of 26 new fire risk information products (243 percent of the target).
- Off-line fire ignition spread and carbon (FISC) model was piloted in 3 conservation areas, meeting the revised target of 3 FISC conservation areas.
- On-line fire ignition and fire spread risk (FISC) data was published on INPE's website, meeting the target.
- 88.89 percent of users satisfied with data provided by the project, exceeding the original target of 65.00 percent. Though this indicator was designed as an intermediate results indicator, it measured the outcome-level results.

Outcomes (ICR, paras 44-62 and Annex 1):

- Real-time information on potential fire spread in the Cerrado was publicly available, achieving the original target. Though this indicator was designed as a PDO indicator, it measured the output-level results.
- Improved information on forest fire risk was publicly available, achieving the original target. Though this indicator was designed as a PDO indicator, it measured the output-level results.
- 21 government institutions, which were in charge of policy, deforestation control, and fire prevention, were using the information on deforestation and fire risk in the Cerrado at project closing, exceeding the original target of 15 government institutions. Both national and subnational level institutions were using the information provided by the project (ICR, page 36). However, more detailed systematic information on how it is being used and whether it is likely to have the required impact is missing.

In addition to the outcome defined in the Results Framework, the ICR reported on the following achieved outcome which did not have any formal target.

- Chico Mendes Institute for Biodiversity Conservation (ICMbio: Instituto Chico Mendes de Conservação da Biodiversidade), local fire brigades, and other stakeholders used the information to improve planning and implementation of fire prevention activities in the Serra do Cipó National Park (ICR, para 58).
- The project results were used during policy discussions to demystify fallacies related to a federal law passed in 2016 (law 4508/2016) allowing cattle to enter the legal reserve areas dedicated to conservation for six months a year (ICR, para 47). The project verified that the presence of cattle ranching was highly associated with the high-impact fires, refuting a false hypothesis of the law that a larger cattle herd could reduce the size of fires by reducing the amount of highly combustible grasses (ICR, para 47).
- According to the external evaluation of the project conducted in 2021, 100 percent of beneficiary agencies' interviewees recognized that the project contributed to institutional strengthening, while 79 percent of managers in the beneficiary institutions recognized about the availability of almost real time and improved quality information and of the systems to enable them to access the information (ICR, para 63).



In summary, information on potential fire spread and forest fire risk was published and used by the relevant government institutions, where the managers were generally aware of the availability of the good quality and nearly spontaneous information and the system through which they could access it. There was anecdotal evidence regarding how the information generated by the systems was used to improve planning and implementation of fire risk management activities. Three PDO targets were met or exceeded, though two of the three PDO indicators focused on output-level results. Referring to the TOC above, some evidence was provided regarding to what extent the achieved PDO targets contributed to promoting sustainable land use and forest management in the Cerrado biome, which was the objective of the Brazil Investment Plan. The achievement of objective 2, therefore, is rated substantial.

Rating

Substantial

OBJECTIVE 3

Objective

Enhance the Member Country's institutional capacity in estimating related GHG emissions in the Cerrado

Rationale

Theory of Change (TOC): The PDO statement focused on outputs, as described in section 3, resulting in insufficient articulation of expected outcomes of objective 3. According to information in the ICR (figure 1, page 12) and the PAD (annex 5, page 49), the TOC of objective 3 targeted the national and subnational level government institutions and envisioned that extending the existing national GHG emissions estimate system to cover the Cerrado biome would result in outputs including the publication of GHG emissions estimates for the Cerrado, contributing to an outcome of improved production and dissemination of biome-scale environmental information. In the long-term, the outcome was envisioned to contribute to improved land use planning and management in Brazil.

Critical assumptions included: (i) the modern modelling approaches and the data on fire risk, fire spread, and GHG emissions provided under the project were used by government institutions for policy development and implementation, deforestation control, and fire event response and prevention; and (ii) a broad range of relevant stakeholders would participate in training, increasing their awareness and developing capacities to interpret and use information generated by the project.

Outputs:

No Intermediate Results indicator to measure achievements of results for objective 3 was set in the Results Framework.

Outcomes (ICR, paras 44-62 and Annex 1):

- GHG emissions estimates for the Cerrado were publicly available, achieving the original target. Though this indicator was designed as a PDO indicator, it measured output-level results. No evidence was provided regarding how the GHG emissions estimates were used.



In addition to the outcome defined in the Results Framework, the ICR reported on the following achieved outcome which did not have any formal target.

- According to the external evaluation of the project conducted in 2021, 100 percent of beneficiary agencies' interviewees recognized that the project contributed to institutional strengthening, while 79 percent of managers in the beneficiary institutions recognized the availability of almost real time and improved quality information and of the systems to enable them to access to the information (ICR, para 63).

In summary, information on GHG emissions estimates was published. The PDO indicator for objective 3 was met. On the other hand, no evidence on the outcome-level results was provided because evidence on utilization of the information was missing. Referring to the TOC above, no evidence was provided regarding to what extent the achieved PDO target contributed to promoting sustainable land use and forest management in the Cerrado biome, which was the objective of the Brazil Investment Plan. The achievement of objective 3, therefore, is rated modest due to insufficient evidence on outcomes.

Rating
Modest

OVERALL EFFICACY

Rationale

Of the three objectives, achievements of two objectives were rated substantial and that of one objective was rated modest. The overall efficacy, therefore, is rated substantial.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic and Financial Analysis: At appraisal, no cost-benefit analysis (CBA) was conducted because the technical assistance nature of the project would not render meaningful results (ICR, annex 4, page 50). At project closing, a CBA was conducted in an external evaluation of the project to assess the impact on stakeholders and their perception of project's results by using the Social Return on Investment method for measuring extra-financial value with 200 scenarios (ICR, para 63). The ex-post CBA revealed that every Brazilian Real invested by the project generated a total monetary return of more than five times the investment amount and only one out of the total 200 scenarios had a cost-benefit ratio lower than one (ICR, para 63).

Aspects of design and implantation that affected efficiency: The project was extended for a total of 19 months due to the following two aspects. First, the implementation delays in early years were caused by the



implementing agency’s unfamiliarity with the World Bank’s procurement and financial management procedures and requirements and insufficient human resources contributed to the project extension (ICR, para 37). Second, after the emergence of COVID-19 pandemic, the need for social distancing measures changed the delivery format of knowledge exchange activities from face-to-face to online and/or hybrid, negatively affecting the participants to acquire the necessary knowledge swiftly (ICR, para 49). No additional financing was made.

The ex-post CBA indicated that the project’s investments generated the total monetary return more than five times the invested amount. The extension of project duration was accompanied by results of a larger number of beneficiaries reached and an additional annual deforestation map developed, without additional costs. The efficiency, thus, is rated substantial.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The relevance of objectives was substantial, as the objectives aligned with the strategies of the government and the World Bank’s assistance but the PDO formulation focused on outputs. The efficacy was substantial, as achievements of two objectives were substantial and another objective was modest. The efficiency was substantial based on the results of the ex-post cost benefit analysis. Overall, the outcome is rated satisfactory.

a. Outcome Rating

Satisfactory

7. Risk to Development Outcome

Ownership and commitment risk: There was a potential risk that the commitment from the Federal Government and involved institutions might not be sustained to maintain the institutional arrangements, the monitoring systems, and the associated human capacity and costs (ICR, para 100). A continued awareness and implementation of fire prevention and control that were demonstrated in selected National Parks might



not be guaranteed after project closing (ICR, para 100). The potential risk was partially mitigated by the country's uniqueness. The institutions in the fields were highly developed and with expertise, supporting them was not dependent on external aid and technical assistance (ICR, para 100).

Political risk: There was a potential risk that changes in the political leadership might negatively affect the financial sustainability of the monitoring system of the Cerrado biome established under the project. To mitigate the risk, the project widely provided data not only to the other projects under the Brazil Investment Plan but also to the general public. There exists a high demand for the data produced by the monitoring system of the Cerrado biome from broadcasting entities and the international community (TTL meeting). The proven usefulness of the data might ensure the sufficient future financing for the system under possible political turnovers.

8. Assessment of Bank Performance

a. Quality-at-Entry

The strategic relevance and approach were adequate in general, as described in section 3. The technical, institutional, and environmental and social aspects were well considered. Implementation arrangements were well-designed and a key element of project success. The risk assessment was adequate to identify and mitigate fiduciary risks related to the weak financial management mechanism in the implementing agency at appraisal. Components were adequately designed to achieve the PDO statement with the capacity of the implementing agencies. On the other hand, the output-focused PDO statement negatively affected the M&E arrangements, as described in section 9. The project design and preparation took more time than initially expected (ICR, para 93). The quality at entry, therefore, is rated satisfactory.

Quality-at-Entry Rating

Satisfactory

b. Quality of supervision

The supervision of fiduciary and safeguard aspects was adequate. The World Bank team maintained close communications with the grant recipients and implementing agencies through technical meetings and phone conferences and gave prompt support as needed. Joint meetings and other technical meetings in Brasília were crucial to integrate the various implementation agencies, identify emerging issues, and provide needed support. The risks associated with the high turnover of Financial Management Specialists at the World Bank were mitigated by adequate transition arrangements (ICR, para 95). On the other hand, the focus on development impact was not strong due to the output-focused PDO and the Results Framework. Because the other projects under the Brazil Investment Plan are still under implementation, outcome-level achievements of the Brazil Investment Plan are yet to be monitored and reported (TTL meeting). The quality of supervision, therefore, is rated satisfactory.



Both the quality at entry and the quality of supervision was satisfactory; thus, the overall Bank performance is rated satisfactory.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The M&E arrangements were well embedded institutionally. The MCTI provided M&E oversight to the project by establishing an independent technical evaluation group to review and assess the quality of intermediate products and reports and provide feedback to the Project Institutional Coordination Committee and the participating entities (ICR, para 82). The objectives in the PDO statement were clearly specified. On the other hand, the PDO formulation was not pitched at the right level, as described in section 3. The theory of change diagram in the ICR (figure 1, page 12) did not indicate outputs of the project. Instead, the theory of change diagram presented output-level results as outcomes. Both the PDO and Intermediate Results (IR) indicators in the Results Framework focused overly on measuring output-level results.

b. M&E Implementation

All the indicators included in the Results Framework had baseline data and were measured and reported. Three IR indicators were revised as follows based on changes that occurred during project implementation. The IR indicator on independent reports on the quality of the project products was dropped due to the loss of relevance (PAD, page 17). The IR indicator on the number of conservation areas which piloted off-line fire ignition and spread risk model decreased its target from four to three due to high costs (human resources and time) to monitor the large geographic areas (ICR, page 40 and TTL meeting). The IR indicator on the number of annual deforestation maps publicly available increased its target due to the project extension (ICR, page 38). The MCTI and the independent technical evaluation group fulfilled their responsibilities on M&E oversight (ICR, para 83). The reliability and quality of M&E data were adequate. M&E functions and processes are likely to be sustained after project closing given that the whole project aimed to strengthen the monitoring capacity of the Cerrado biome by the government institutions. On the other hand, the output-oriented PDO statement and the Results Framework were not adequately adjusted during implementation. Some outcome-level results were verified by the endline evaluation at project closing, compensating the weakness of the Results Framework to a certain extent.

c. M&E Utilization



The M&E findings were communicated to the stakeholders and used for annual project planning (ICR, para 86). Some positive shifts in the implementation direction of the project were attributable to findings of the Mid-term Review and follow-up actions. The M&E data and system developed under the project provided pertinent information on forest management, forest fire risks, and GHG emissions to the parallel and subsequent projects in BIP. On the other hand, focusing on this project itself, the M&E data mainly provided evidence of application of inputs or achievement of outputs under the project.

The weaknesses in the M&E design were partially addressed during M&E implementation, resulting in the limited utilization of the M&E data. Endline evaluation of the project supplemented the Results Framework by providing additional evidence on outcomes. The M&E quality, therefore, is rated substantial.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

Environmental Safeguards: The project was assigned a category C with no further requirements on environmental assessments (ICR, para 88). The project triggered policies on Natural Habitats (OP/BP 4.04) and Forests (OP/BP 4.36) and generated positive impacts on protected areas in the Cerrado biome (ICR, para 88).

No social safeguard policies were triggered throughout project implementation (PAD, para 39 and ICR, para 89). No adverse social impacts were identified by the supervision team at project closing (ICR, para 89). No complaints were received through the Grievance Redress Mechanism during project implementation (ICR, para 92).

b. Fiduciary Compliance

Financial Management: The financial management arrangements including staffing, budgeting, accounting, internal control, funds flow, financial reporting, and auditing adhered to the standards required by the World Bank (ICR, para 90). The audit reports were received mostly in a timely manner with minor delays (ICR, para 90). The auditors expressed positive opinions on the financial reports and confirmed the project's compliance with financial covenants (ICR, para 90). On the other hand, the project management unit's mistake of classifying consultancy costs as operating costs had not been corrected since 2018, despite the action plans agreed during the supervision missions (ICR, para 90).

Procurement: The risks concerning procurement function for the project identified in the PAD (page 43) were not fully mitigated by the risk mitigation measures, resulting in initial implementation delays due to the Research Development Foundation (FUNDEP: Fundação de Desenvolvimento da Pesquisa)'s unfamiliarity with the World Bank Group's procurement procedures and insufficient technical capacity to identify



required specifications of goods and equipment (ICR, para 91). The procurement capacity of FUNDEP gradually increased, especially in the last two years of project implementation (ICR, para 91).

c. Unintended impacts (Positive or Negative)

No unintended impacts were reported by the ICR.

d. Other

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Highly Satisfactory	Satisfactory	The relevance of objectives was substantial, as the objectives aligned with the strategies of the government and the World Bank's assistance but the PDO formulation focused on outputs. The efficacy was substantial, as achievements of two objectives were substantial and another objective was modest. The efficiency was substantial based on the results of the ex-post cost benefit analysis. Overall, the outcome is rated satisfactory.
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

The ICR (paras 101-107) presented five lessons. Three of them are presented below with rephrasing because these lessons may be useful for future projects related to the biome-level environmental monitoring.

Newly targeting the Cerrado savanna-forest biome is a necessary change from the prior operations with nearly exclusive emphasis on the Amazon rainforest for reducing deforestation and GHG emissions in Brazil. Progressively increasing recognition on the importance of the Cerrado biome for the economy, biodiversity conservation, and adaptation and



mitigation of climate change has expanded funded initiatives in the area. A more intentional focus on addressing the issue of land-use change (Brazil's primary source of GHG emissions) in both the Amazon and the Cerrado is of paramount importance and would be a bold initiative to better account for and reduce GHG emissions at the national and global levels.

The Project demonstrated the transformational potential of a tightly focused, science-based project led by experienced, technically sound, and sophisticated institutions. INPE's solid experience with activities like those of the Project but focused on the Amazon was a key advantage in replicating that successful experience in the Cerrado biome, thereby minimizing uncertainty and difficulties in implementation and delivery. The synergies between three executing institutions, INPE, UFG and UFMG, enhanced and strengthened the development of the information systems, datasets, and tools. The complementarity between the technical expertise of INPE and UFMG enabled the development of information and first-of-its-kind modelling approaches (e.g., Fires risk, fire spread forecasts). Improved estimation of GHG emissions for the Cerrado biome contributes to enhanced global accountability of Brazil, considering its commitments in the context of the UNFCCC and towards 2025. Developing and scaling up of monitoring and accountability systems for other biomes of Brazil (which are incredibly vast and biologically diverse in nature) contribute to global climate change efforts and deliver benefits beyond the national border. As an outcome, the Project represents a persuasive argument for engaging in larger-scale environmental monitoring projects in Brazil. This is especially so when the agencies demonstrate excellence and national capacity (even in times of shifting government priorities and uncertain budgeting prospects), and when a disciplined approach limits project scope to a set of essential, nationally proven, and well-integrated activities that build upon the expertise of the agencies involved in implementation.

The systematic provision of better information systems is a cost-effective public investment to pursue improved planning, response, and action on deforestation and fire risk. Access to accurate data, information, technology, and forecasting knowledge represents a game-changer at multiple levels within government and society, with the added value of increased awareness and validation of results. The application of such monitoring and modelling systems is particularly impactful when it is implemented to bridge the gap within institutional environments which are not used to such technology systems to effectively engage complex coordination efforts to the benefit of progressing its operations in office and field settings (e.g., local fire brigades, ICMBio, local stakeholders). The TerraBrasilis platform allows institutional and public users anywhere in Brazil (and abroad) to rapidly access deforestation information, analyze and verify it, and apply it to their specific purpose. The development of a state-of-the-art fire risk ignition and spread probability models is a major advance in the effort to control and prevent fires in the Cerrado biome with no equivalent anywhere in the world. These results will require continued support and expansion moving forward.

13. Assessment Recommended?

No

14. Comments on Quality of ICR



The ICR provides a detailed overview of the project. The narrative is supported by available evidence that was collected from the project's M&E system and the external evaluation. The ICR aimed to triangulate data to reach conclusions where possible. The ICR's lessons are responding to the specific experiences and findings for the project. The quality of evidence and analysis is aligned to the messages outlined in the ICR. On the other hand, the theory of change was brief and did not articulate the links between activities, outputs, and outcomes. Orientation of the narrative to the theory of change was limited and constrained the broader emphasis on essential transformations in the sector. Overall, the quality of ICR is rated substantial.

a. Quality of ICR Rating
Substantial