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ARGENTINA

**DEVELOPMENT OF A FOREST WASTE-TO-ENERGY MODEL TO COVER THE
BASIC NEEDS OF THE VULNERABLE POPULATION IN THE
MUNICIPIO OF SAN CARLOS DE BARILOCHE**

(AR-T1175)

DONORS MEMORANDUM

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PROJECT SUMMARY

DEVELOPMENT OF A FOREST WASTE-TO-ENERGY MODEL TO COVER THE BASIC NEEDS OF THE VULNERABLE POPULATION IN THE MUNICIPIO OF SAN CARLOS DE BARILOCHE (AR-T1175)

Heating is a primary need in the Patagonian region of Argentina because of low winter temperatures. In Argentina's energy matrix, the lowest cost and most efficient source of heating is network-distributed natural gas. In the municipio of San Carlos de Bariloche, the most vulnerable populations have no access to natural gas since the existing gas pipeline does not accept new connections, so they have to resort to bottled gas or firewood to cover their heating and cooking needs. In this context, *Plan Calor* (Heat Plan), administered by the Province of Río Negro, distributes firewood for heating to socioeconomically vulnerable families. In Bariloche, *Plan Calor* covers some 3,500 families; however, the plan distributes only enough firewood to cover about 20% of their real needs for combustion material.

In the municipio of Bariloche, more than 50,000 tons of forest waste are estimated to be available each year comprised of: (i) pruning material from municipal thinning activities, (ii) the thinning of commercial forests, and (iii) waste from industrial processing in the sawmills. Such waste is usually burned, disposed of on site, or sent to the municipal dump. Not only are these organic resources being underused as potential combustion material, their disposal also represents a high cost to the municipio and a significant threat due to the risk of fire.

The project proposes to put into operation an innovative waste-to-energy system based on the production of fire logs made from forest waste (the "Project"). An industrial system for producing fire logs will be developed and a plant installed to produce them. The plant will be operated by preexisting cooperatives of urban recyclers. The Municipal Government of San Carlos de Bariloche will buy the fire logs produced at the plant to gradually meet the demand for combustion materials under *Plan Calor*, and the surplus will be placed on the market for institutional and individual consumers. The Project will initially be implemented in the municipio of San Carlos de Bariloche, and the experience will be replicated later in another municipios in the *Comarca Andina*.¹

The Project will support: (i) the comprehensive diagnostic assessment of the challenges involved in disposing of forest waste; (ii) the fine-tuning of the intervention strategy; (iii) the formulation of necessary agreements among stakeholders; (iv) the design and

¹ The *Comarca Andina* is comprised of the Río Negro community of El Bolsón, the rural communities of Mallín Ahogado, Los Repollos, El Manso (province of Río Negro), the province of Chubut's communities of El Hoyo, Lago Puelo, El Maitén, Epuyén, and Cholila and the rural communities of Las Golondrinas, Entre Ríos, Cerro Radal, Puerto Patriada, and Leleque.

development of equipment and tools for logistical and production processes;² (v) institutional strengthening of the cooperatives that will operate the processing center and training for personnel involved in its operation, (vi) market analysis and development of distribution channels; (vii) awareness-raising among the groups involved about the generation and disposal of waste and fire risk prevention; (viii) the development of proposals to adapt the regulatory framework on recycling and the efficient and sustainable management of forest resources and waste; and, (ix) systemization and dissemination of the experience.

The Project will support the implementation of an innovative and inclusive business model as well as the development of an industrial system and a technology that could be of great significance to Latin American communities that have available forest resources. Despite the great potential existing in Latin America, there is limited experience with the deployment of accessible technologies and profitable business models that support energy efficiency and the generation of energy from biomass.

The Project contributes to the aspirational indicator of increasing by 100 million the number of people living in sustainable cities, based on its contribution to the sustainability of the city of San Carlos de Bariloche through the pursuit of: (i) a more efficient use of forest resources; (ii) a reduction in forest fire risk; (iii) an increase in the level of coverage of the vulnerable population's energy needs; and (iv) a reduction in the incidence of respiratory and gastrointestinal diseases among the vulnerable population. In addition, the main outcomes expected from the Project include: (i) 20,000 tons of forest waste not burned or sent to the dump; and (ii) 3,500 families with unmet basic needs benefiting from *Plan Calor* whose energy needs are met using fire logs on a carbon-neutral basis.

The climate change strategy of the Inter-American Development Bank (IDB) prioritizes the promotion of sustainable forms of energy, explicitly including "waste to energy" (e.g., incineration or gasification), bioenergy, and biomass cogeneration. The Project is also closely aligned with the IDB's country strategy with Argentina for the 2016-2019 period, which provides for the following action proposals: (i) support for the energy sector with emphasis on the development of renewable energy; and (ii) promotion of environmentally sustainable solutions. Lastly, the Project will add value to the knowledge externalities generated by innovative activities in renewable energy, particularly biomass, supported by IDB loan operations AR-L1141 and AR-L1181.

² The technology for briquetting or pelletizing plant waste from pruning or thinning is already known and used in various places in Argentina, including the Patagonian region. The characteristics of the available biomass and the specific environment in each location mean that the technology must be specifically adapted so as to obtain the best result. For example, although fire logs are produced in the area of Neuquén, or Misiones, the types of biomass are different in each location. Specifically, there has recently been significant volcanic activity in the area of Bariloche. This means that the standard tools and processes must now be adapted to the (still high) ash content that is expected to be found in the waste from pruning and thinning.

ANNEXES

Annex I	Results Matrix
Annex II	Summarized Budget

**INFORMATION AVAILABLE IN THE TECHNICAL DOCUMENTS SECTION OF THE MIF PROJECTS
INFORMATION SYSTEM**

Annex III	Itemized Budget
Annex IV	Diagnostic of Executing Agency Needs (DNA)
Annex V	Project Status Reports (PSRs) and Attainment of Milestones, Fiduciary Agreements, and Institutional Integrity
Annex VI	Procurement Plan

ABBREVIATIONS

MINCyT	Ministry of Science, Technology, and Productive Innovation
UBNs	Unmet basic needs

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EXECUTIVE SUMMARY

Country and geographic location:	Argentina – Patagonian Region – Province of Río Negro – Municipio of San Carlos de Bariloche.		
Executing Agency:	INVAP Foundation		
Focus Area:	Inclusive Cities		
Coordination with other donors/Bank operations:	The Project will add value to the knowledge externalities generated by innovative activities in renewable energy, particularly biomass, supported by operations AR-L1141 and AR-L1181, executed with Argentina's Ministry of Science, Technology, and Productive Innovation.		
Project beneficiaries:	3,500 families with unmet basic needs, beneficiaries of <i>Plan Calor</i>		
Financing:	Technical Cooperation:	US\$831,600	49.95%
	Investment:	US\$ 0	
	Loan:	US\$ 0	
	Other:	US\$ 0	
	TOTAL MIF CONTRIBUTION:	US\$831,600	
	Contribution:	US\$833,200	50.05%
	Cofinancing:	0	0%
	TOTAL PROJECT BUDGET:	US\$1,664,800	100%
Execution and disbursement periods:	42 months for execution and 48 months for disbursement.		
Special contractual conditions:	Special conditions precedent to the first disbursement will be: (i) Submission of a letter of collaboration signed by the Municipio of San Carlos de Bariloche; and (ii) Contracting of the Project Coordinator.		
Environmental and Social Impact Review:	This operation was preevaluated and classified in accordance with the requirements of the IDB's Environment and Safeguards Compliance Policy (OP-703) on 26 October 2016. Given that the impacts and risks are limited, the category proposed for the Project is "C."		
Unit responsible for disbursements	MIF/CAR		

I. THE PROBLEM

A. Description of the problem

- 1.1 Heating is a primary need in the Patagonian region of Argentina because of low winter temperatures. In the municipio of San Carlos de Bariloche, the most vulnerable populations have no access to the natural gas network since the existing gas pipeline does not accept new connections. Thus, the low-income population must resort to bottled gas or firewood to cover, often only partially, their heating and cooking needs, which significantly increases their costs compared to families with access to the gas network.³ This situation is more serious in communities with less social and urban development, due to the shortages associated with infrastructure deficits. In the most vulnerable areas, dwellings are often constructed using recycled materials without internal and external cladding, so thermal insulation is inadequate. Houses have roofs without ceilings, with external coverings made of cardboard sheets that are severely deteriorated by the heavy rain and snow, undermining their quality.
- 1.2 In this context, the so-called *Plan Calor*, administered by the province of Río Negro, distributes firewood for heating to socially vulnerable families. The purpose of the plan is to support families in the various municipios, *comisiones de fomento* [a type of territorial division for administrative purposes], and rural areas in the southern and Andean regions without access to natural gas. The plan gives priority to people with disabilities, the elderly, single mothers, and the unemployed. In the municipio of San Carlos de Bariloche, *Plan Calor* reaches some 3,500 socioeconomically vulnerable families, which in 2016 entailed an outlay of approximately US\$160,000 by the Province of Río Negro to purchase 25,000 tons of firewood.⁴ However, the firewood distributed under this plan is only enough to cover about 20% of the families' real needs for combustion material. In 2016, 2,500 tons of firewood are being distributed yet the real needs of these families are estimated at about 11,200 tons.⁵
- 1.3 The municipio of San Carlos de Bariloche, nestled in a densely forested area, generates significant pruning waste (woody material) as a result of the maintenance of woods in the urban areas. That woody material, which constitutes the vast majority of pruning waste, is discarded in municipal dumps, at a high cost to the Municipio.⁶ Only a small fraction of the pruning waste is used as input for *Plan Calor*. The province of Río Negro acquires the bulk of the firewood used in *Plan Calor* through

³ <http://www.anbariloche.com.ar/noticias/2016/05/10/52974-calefaccionarse-con-gas-ensvasado-cuesta-mas-de-3-mil-pesos-por-mes>

⁴ http://www.rionegro.com.ar/bariloche/bariloche-compra-lena-por-2-1-millones-de-pes-DARN_1935829

⁵ About 3,500 families are beneficiaries of the *Plan Calor* in Bariloche; they need an estimated eight cubic meters of firewood (3.2 tons) per year to meet their needs for heating their homes, water, and food. Consequently, there is real demand of about 28,000 cubic meters or 11,200 tons of firewood per year. Thus, it is estimated that the *Plan Calor*'s 2016 campaign, which will provide 2,500 tons of firewood in Bariloche, will cover only 22.32% of the real demand for firewood.

⁶ According to the estimates from the Municipal Government's Parks and Gardens Division, the volume of material discarded is twice the volume of material distributed through *Plan Calor*. According to estimates from the Ministry of Social Development, the cost for final disposal of the pruning waste (cost to "bury") reaches an average of AR\$400 per cubic meter buried (US\$26.6/m³).

public tendering that, as mentioned, resulted in the purchase of 2,500 tons of firewood (at US\$63 per ton⁷) during the 2016 season.

- 1.4 Not only is the organic waste from pruning being underused as potential combustion material, it also presents a significant threat due to the high risk of fire that its disposal in municipal dumps entails (fires are very frequent in dry wooded areas like Bariloche⁸).
- 1.5 The prefeasibility analysis indicates an approximate availability of some 8,000 tons of forest resources per year, referring solely to material from the pruning and thinning⁹ done by the Municipio of San Carlos de Bariloche, which currently goes to the dump. At the same time, approximately 60% of the estimated 34,300 tons of forest resources from the thinning of commercial forests and waste from industrial processing in the sawmills (untreated wood discards without additives or paint) should be considered a usable resource.
- 1.6 At the household level, firewood is a highly inefficient fuel for heating and also produces a large amount of smoke inside the dwelling, which is associated with the prevalence of respiratory diseases.¹⁰ In addition, there is a correlation between access to energy services and the prevalence of gastrointestinal diseases resulting from the ingestion of food that is insufficiently cooked.
- 1.7 There are new energy technologies for converting organic waste into safer, cleaner and more efficient products, such as fire logs/briquettes¹¹ or pellets, which could provide an important solution to the energy needs of the vulnerable population benefiting from *Plan Calor* in Bariloche and could be scaled to other communities in Patagonia. The technology of heating with briquettes or fire logs has been successfully implemented in European countries and in Canada, where fire logs made from different types of biomass waste have become a conventional form of fuel. The use of this type of organic waste assumes as a minimum hypothesis the reduction of carbon (CO₂) emissions.
- 1.8 These technologies could be implemented through an easily operated and maintained industrial system. They could thus be operated by preexisting cooperatives of urban recyclers consisting of members of the vulnerable population

⁷ <http://www.bariloche.gov.ar/noticia2014.php?noticia=4797>

⁸ <http://www.splif.rionegro.gov.ar/index.php?contID=21079>

⁹ Forest thinning is a practice that consists of removing excess trees or branches in order to stimulate growth in the diameter and height of those trees that remain standing.

¹⁰ http://www.salud.rionegro.gov.ar/sala/documentos/documentos/docu1_rn.pdf

¹¹ Based on studies published by the Swedish University of Agricultural Sciences (1998) and the Swedish Energy Agency (2003) used by the National Institute of Industrial Technology (INTI) as a source in the studies related to its prototype SARA stove (http://www.inti.gov.ar/tecno_sustentables/ecotecnologia.htm), 1 ton of fire logs or briquettes provides heat energy similar to 1.73 tons of firewood. In addition, it is estimated that 2.21 kilograms of briquettes replace one liter of diesel. In addition to heat efficiency, some of the other advantages of the products are that they: are carbon-neutral, 100 % ecological and natural, easily and quickly lit, low moisture, very dense, clean, homogenous, easily handled and divided, and odor-free; provide constant combustion without smoke or sparks; have no binding agents or additives; take up less space; and produce a lower percentage of ash than firewood. Lastly, it is important to note that briquettes can be used anywhere that firewood is used, which means that using them does not mean having to make any adjustments to household furnishings.

benefiting from the Project, thereby contributing to real job creation among that population.

- 1.9 Based on the problems described, the Project will seek to: (i) increase *Plan Calor*'s coverage levels both in San Carlos de Bariloche and in communities that have conditions suitable for replicating the solution to be implemented; (ii) generate the conditions that over the long term will make it possible to reduce the incidence of respiratory and gastrointestinal diseases associated with insufficient levels of coverage of energy requirements for heating and cooking among the population with unmet basic needs (UBNs)—the primary target of *Plan Calor*; (iii) include cooperatives of recyclers in businesses that prove to be profitable and self-sustaining and help to improve their living conditions; (iv) productively use the 8,000 tons of pruning waste generated by the Municipio each year and the material from the thinning of commercial forests, replacing the supply of firewood that the Municipio purchases in the context of *Plan Calor*; (v) reduce the cost of final disposal of pruning waste; (vi) reduce the risk of fires due to spontaneous combustion of forest waste that is not collected and/or is disposed of in the municipal dump.

II. THE PROPOSED INNOVATION

A. Project description

- 2.1 The goal of the Project is to help cover the basic energy needs for heating and cooking of the vulnerable population in cities with forest resources. To that end, the purpose of the Project is to develop and test a comprehensive, inclusive, and sustainable business model to use forest waste to provide energy to the low-income population.

- 1.1 The Project proposes to put into operation an innovative waste-to-energy system based on the production of briquettes or fire logs and/or chips from pruning waste and other biomass alternatives. An industrial system will be developed for producing fire logs,¹² chips, and other byproducts.¹³ Support will initially be provided for installing a production plant in the Environmental Center of the city of San Carlos de Bariloche, which will be operated by preexisting cooperatives of urban recyclers. The Municipio of San Carlos de Bariloche will buy the fire logs produced in that plant to gradually meet the demand for combustion material under *Plan Calor*, and the surplus will be placed on the market for institutional consumers (basically institutions and hotels) and individuals (through bulk sales channels).
- 2.2 The Project will support: (i) the comprehensive and participatory diagnostic assessment of the challenges involved in disposing of pruning and thinning waste; (ii) the fine-tuning of the intervention strategy (logistical and productive processes, business plan, sustainable management of forest resources, and fire risk mitigation); (iii) the formulation and conclusion of the necessary agreements and commitments among Project stakeholders; (iv) the design and development of equipment and tools for logistical and production processes; (v) training for personnel involved in the operation and logistics of the processing center; (vi) institutional strengthening (legal, organizational, commercial, quality management) of the cooperatives that will operate the processing center; (vii) market analysis and development of channels for distribution to institutional and individual consumers; (viii) awareness-raising among the groups involved about the generation and disposal of waste and fire risk prevention; (ix) the development of proposals to adapt the regulatory framework on recycling and the efficient and sustainable management of forest resources and waste; and (x) systemization and dissemination of the experience.
- 2.3 This approach will launch a profitable and self-sustaining business model operated by cooperatives of urban recyclers made up of members of the Project's beneficiary population, vulnerable people with UBNs in the municipio of San Carlos de Bariloche

¹² Within the framework of a project financed by MINCYT's Consejo de la Demanda de Actores Sociales [Social Actors Demand Council] program (PROCODAS), the INVAP S.E. company, in partnership with other institutions (SEDRONAR, CONICET), developed a prototype semi-artisanal briquette plant that operates functionally on the basis of the process of mechanical agglomeration of flammable waste and biomass. This prototype has sought to achieve standards relating to ease of operation, ease of maintenance, and construction using available materials easily accessible in commercial chains. The briquetting machines to be developed in the context of this Project represent an improvement over the earlier model in that the briquettes' heat efficiency is increased by replacing the agglomeration process with an extrusion and pelleting process. In addition, the briquetting machines to be developed will make it possible to bring the production of briquettes up to industrial scale.

¹³ In the context of the sustainability of the entire business model, all the biomass available from the initial collection process and intermediate processing associated with the production of fire logs must be managed. These processes generate surplus materials or discards from the principal line, which could be used as potential inputs for other value chains, in applications auxiliary and complementary to the central objective. From this model, the project expects to develop byproducts for specific nonenergy-related use (composting, small-scale production of cardboard or sheeting) and/or for urban landscaping use. Prefeasibility studies consider the need to "chip" forest matter in a prior logistical process before it enters the plant. Those chips, as a byproduct, could be used as fuel in boilers for institutional heating or alternatively used in composting, other artisanal applications, and/or as filling and covering material in urban landscaping and gardens. Thus, the Project will probably promote the development of products along three functional lines: (a) products for energy use; (b) products for nonenergy-related use (composting, small-scale production of cardboard or sheeting, etc.); and (c) products for urban-landscaping use.

and similar municipios where replicating and scaling up the experience is considered feasible and advisable.

- 2.4 **Innovation.** The Project will support the implementation of an innovative and inclusive business model as well as the development of an industrial system and a technology that could be of great significance to Latin American communities that have available forest resources. Despite the great potential existing in Latin America, there is limited experience with the deployment of accessible technologies and profitable business models that support energy efficiency and the generation of energy from biomass. The role of the INVAP S.E. company and its value chain is strategic to the development of this innovation, as they are technological allies in the generation of a logistical and productive solution that is appropriate in terms of dimensioning and functionality, based on their own engineering efforts. The Project provides for the following components:

- 2.5 Component I: Comprehensive diagnostic assessment of the challenges and fine-tuning of the intervention strategy.

As a result of this component, a comprehensive, participatory diagnostic assessment of the challenges involved in disposing of the waste from pruning and thinning will be performed, with a view to generating a technological and institutional-social solution that is sustainable. To this end, the main actors participating in the process—both public (national, provincial, and municipal) and private (forest companies, consumers), the cooperatives of recyclers, the INVAP S.E. company, and others that could prove relevant—will be brought together. In addition, the assessment will generate an analysis of the regulatory framework, the intervention strategy, the technical solution, and the business plan for the cooperatives (for managing municipal waste and participating in the forestry companies' supply chain to provide a solution to pruning waste). Based on this comprehensive assessment of the simultaneous approach to the problems of pruning and forest waste, the Project will: (i) accurately quantify the volume of usable biomass available (waste from pruning, forest debris, and other sources); (ii) identify alternatives for the efficient use of that biomass to complement the production and marketing of fire logs; (iii) analyze the replacement of energy sources in institutional settings and the related demand; (iv) define convergent strategies for mitigating the risk of fires based on cultural and regulatory parameters and preexisting forestry and fire risk prevention plans; (v) build strategies for sustainable management of biomass that could lead to recommendations on adapting the current legal framework;¹⁴ and, (vi) develop agreements among the parties based on the current legal framework and identify regulatory gaps for which proposals should be made.

A Project "Liaison Committee" (see paragraph 5.8) will be formed, to include the most important actors in the intervention strategy, to monitor its implementation.

- 2.6 Component II: Design and development of the technological solution.

Within the framework of the activities under Component II, based on the comprehensive diagnostic assessment performed under Component I, processes need to be defined for the classification, separation, inflow, drying, and production

¹⁴ For example, to regulate the incineration of waste, the disposal of waste from sawmills and afforestation, etc.

of fire logs, the generation of byproducts, and outflow logistics. Those definitions will involve the design, dimensioning, and development of equipment and tools needed for chipping, drying, and extrusion of briquettes or logs, as well as the layout of the plant, initially for the site available at the headquarters of the Environmental Center in the city of San Carlos de Bariloche.

The municipio of Bariloche will provide the location where the fire log production plant will be set up, at the Environmental Center in the city of San Carlos de Bariloche. MIF resources will be used to finance the design, dimensioning, and engineering of the equipment, tools, and plant, while the materials for developing and building that equipment will be financed from the INVAP Foundation's contribution.

A second effort will promote replication of the solution implemented, at a location in the Cordillera to be identified based on the conditions evaluated in the context of diagnostic assessment activities, probably in a municipio in what is called the "*Comarca Andina*" [Andean district]. Those activities will be leveraged in the design solutions developed for the Bariloche Environmental Center.

2.7 Component III: Strengthening of cooperatives of recyclers.

The objective of this component is to strengthen the technical, legal, and commercial capacities of cooperative operators, and to raise the awareness of and train stakeholders and groups involved in the generation and disposal of waste.

Within the framework of this component, the Project will seek to strengthen the capacities of cooperative operators in: (i) legal structures suggested for the operation of cooperatives, in terms of both logistics and processing; (ii) survey and development of commercial channels related to institutional demand and retail demand, for the public (municipal) sector as well as for becoming part of the value chain of large generators of waste from pruning and thinning, and possible consumers (hotels, universities, etc.); (iii) formulation of commercial strategies and policies on quality, and management through channels; (iv) technical matters associated with operating the processes of classification, separation, inflow, drying, production of fire logs, generation of byproducts, and outflow logistics.

Awareness-raising campaigns will be carried out to inform the target population of the advantages of fire logs, thereby ensuring effective adoption/ownership of this new technology. In addition, the awareness of the groups involved in the generation and disposal of waste will be raised in an effort to promote savings in the classification, transportation, and processing of forest resources and the sustainable use thereof. Local workers will be trained in coordination with the Department of Social, Cultural, and Sports Development of the San Carlos de Bariloche Municipal Government, as well as other public and private agencies with local reach, to carry out awareness-raising tasks

2.8 Component IV: Systematization of the model and transfer to other municipios.

The objective of this component is to systematize the model for processing forest waste and generating sustainable and inclusive businesses based on the model. This systematization will be achieved from the perspective of both technical and organizational processes (public-private coordination and strengthening of cooperatives of recyclers).

As a result of the activities under Component I, good practices that help to improve the municipal legal framework are expected to be generated and transferred with regard to regulating: (a) activities in the generation, collection, and final disposal of waste; (b) the efficient, rational, and self-sustaining use of forest resources; (c) the formalization and promotion of fire prevention plans; (d) tax, contributory, and promotional systems for managing recycling and the “waste-to-energy” process.

The model will be replicated in another municipio in the Cordillera region, to be determined during the course of the diagnostic assessment referred to in Component I, giving priority to municipios in the so-called “*comarca andina*.” Public and private organizations will be assisted in the startup and implementation of the model, as well as with appropriate technological solutions.

Lastly, the Project hopes to contribute to the public agenda by implementing a strategy for disseminating results to key audiences: the public sector in the environmental and forestry sector, the private forestry sector, nonprofit organizations, cooperative banks, and recyclers’ organizations, among others.

B. Project results, measurement, monitoring, and evaluation

- 2.9 The Project contributes to the aspirational indicator of increasing by 100 million the number of people living in sustainable cities, based on its contribution to the sustainability of the city of San Carlos de Bariloche through the pursuit of: (i) a more efficient use of forest resources; (ii) a reduction in forest fire risk; (iii) an increase in the level of coverage of the vulnerable population’s energy needs; and (iv) a reduction in the incidence of respiratory and gastrointestinal diseases among the vulnerable population.
- 2.10 The Project’s main outcome indicators also include:
- a. Number of tons of forest waste from municipal pruning, sawmills, and/or thinning not burned or sent to the dump and used instead as an energy resource: 20,000 tons during the Project execution period.
 - b. Net number of jobs to be created (CRF330301): 40
 - c. Population with UBNs benefiting from *Plan Calor* whose energy needs are met through fire logs on a carbon-neutral basis:¹⁵ 3,500 families
- 2.11 At the start of the execution period, a monitoring system will be set up so that performance, outcome, and impact indicators can be monitored, and thus provide daily feedback for Project implementation. A midterm evaluation will be conducted half way through the execution period. Its main objective will be to analyze the status of Project execution and recommend potential adjustments to the intervention strategy based on lessons learned. At the end of the execution period, a final evaluation will be performed. Its main objective will be to systematize the experience carried out and draw lessons to facilitate the sustainability and replication of the intervention.

¹⁵ <http://www.adraargentina.org/briquetas/>; http://www.blusterpellet.com/imatges/blusterpellet05_cas.pdf

III. ALIGNMENT WITH THE IDB GROUP, SCALABILITY, AND PROJECT RISKS

A. Alignment with the IDB Group

- 3.1 The IDB's climate change strategy prioritizes the promotion of sustainable forms of energy, explicitly including "waste to energy" (e.g., incineration or gasification), bioenergy, and biomass cogeneration. The Project is also closely aligned with the IDB's country strategy with Argentina for the 2016-2019 period. In concrete terms, the priority of "improving the business climate" includes the following action proposals: (i) supporting the energy sector with emphasis on the development of renewable energy; and (ii) fostering environmentally sustainable solutions. IDB loan operations with the Ministry of Science, Technology, and Productive Innovation (MINCyT) currently under way (AR-L1141 and AR-L1181) support innovative activities in renewable energy, particularly biomass, and several of these projects include INVAP S.E. as a participant. This Project would place value on the knowledge externalities generated by these activities.

B. Scalability

- 3.2 Once the experience in Bariloche is developed, the INVAP Foundation plans to scale up the project in the remaining municipios in the province of Río Negro (its area of influence), beginning alternatively with localities in the Cordillera region or in the so-called *Línea Sur*.¹⁶ The participation of strategic partners like the INVAP S.E. company and the governments of Bariloche and Río Negro will facilitate the expansion and sustainability of this model. Despite the great potential existing in Latin America, experience deploying accessible technologies and profitable business models that support energy efficiency and the generation of energy through biomass is limited. Thus, this experience could be replicated in numerous communities and cities in Argentina and the region that present similar conditions in terms of the need for energy for heating and cooking and the availability of organic and forestry waste that is unused or used inefficiently. To facilitate future replications, the Project will focus on the creation of a robust economic case and the systematization and dissemination of the experience.

C. Project risks

- 3.3 The Project poses three main risks: (i) the technical risk associated with adaptation of the logistical and production solutions to be developed, with respect to the nature of the residual pruning and thinning material available; (ii) the risk of resistance to using fire logs, both among the beneficiary population of *Plan Calor* and potential consumers, given that the generation of commercial channels for placing incremental volumes of surplus product (fire logs and chips) at market value is anticipated, once *Plan Calor* demand is satisfied; and (iii) the risk associated with institutional weakness of the plant operators.
- 3.4 The product development risk includes the possibility of not being able to meet all the requirements. This aspect of the risk is mitigated through the process of designing the logs and byproducts, establishing a procedure for the identification and scoring of requirements by coordinating with agencies that interact with the

¹⁶ http://www.patagonia.com.ar/Ing.+Jacobacci/714_Las+localidades+de+la+Línea+Sur+de+Río+Negro.html

- beneficiary population/consumers, accessing data on prior experience in the region and other regions with similar characteristics, and validating the design of the logs before the final design through trials verifying that the requirements have been met.
- 3.5 The risk associated with the beneficiary population adopting the product is mitigated through awareness-raising work carried out by agents working in the area and the adaptation of the regulatory framework so as to generate appropriate incentives. The Project also proposes that the commercial adoption of fire logs and chips by prestigious institutions in the city may contribute to adoption of the product by the beneficiary population and retail commercial channels.
- 3.6 The institutional weakness in the cooperatives and their members represents a risk according to prior experience with groups of urban recyclers. This risk is mitigated through continued support throughout the entire life of the Project in order to address aspects related to the design of management processes in the resulting organization and development of partnerships with other public and private actors. The legal changes related to grassroots productive organizations now being implemented in Argentina are expected to be beneficial to the success of the Project.

IV. INSTRUMENT AND BUDGET PROPOSAL

- 4.1 The Project's total cost is US\$1,664,800; of this amount, US\$831,600 (49.95%) will be contributed by the MIF and US\$833,200 (50.05%) will be contributed by the executing agency. The MIF contribution will be in the form of nonreimbursable technical-cooperation funding.
- 4.2 **Retroactive recognition of funds from the contribution.** Expenses for representation, travel, feasibility studies, and Project formulation for management of the Project stakeholders' involvement incurred by the INVAP Foundation, the INVAP S.E. company, and its technology suppliers, as from July 2016 and totaling up to US\$10,000, will be retroactively recognized as part of the INVAP Foundation's contribution.

Ref. #	COMPONENTS	TOTAL	MIF	Contribution
1	Component I: Comprehensive diagnostic assessment of the challenges and fine-tuning of the intervention strategy	307,400	142,000	165,400
2	Component II: Design and development of the technological solution	515,000	108,000	407,000
3	Component III: Strengthening of cooperatives of recyclers	325,000	262,800	62,200
4	Component IV: Systematization of the model and transfer to other municipios	191,000	68,000	123,000
5	Project administration (executing unit costs)	239,400	163,800	75,600
6	Midterm and final evaluations	22,000	22,000	0
7	Ex post reviews	15,000	15,000	0
8	Contingencies	50,000	50,000	0
	TOTAL	1,664,800	831,600	833,200
	% of Financing		49.95%	50.05%

V. EXECUTING AGENCY AND IMPLEMENTATION STRUCTURE

A. Description of the executing agency and other Project partners

- 5.1 The INVAP Foundation will be the executing agency for this Project and will sign the agreement with the Bank. The INVAP Foundation is a nonprofit organization created to facilitate and increase the technological transfer of knowledge generated by the INVAP S.E. company, including its application for purposes of social and economic inclusion. It has professionals with extensive experience in managing Projects with small and medium-sized enterprises, including members of the value chain consisting of the INVAP S.E. company's suppliers. The INVAP Foundation's management team has participated in the management of complex projects with multiple national and international actors.
- 5.2 The INVAP Foundation has proven experience in projects financed by the IDB, through assistance, as a Technology Liaison Unit (Law 23877), provided to companies and institutions relating to financing promotion and tools offered by MINCyT through the programs of the National Agency for Scientific and Technological Promotion (ANPCyT). The Foundation has a cooperation agreement with the San Carlos de Bariloche Municipal Government to carry out projects with social impact.
- 5.3 The INVAP Foundation will coordinate with the INVAP S.E. company and its technology providers on the management of funds for the components and inputs required for the construction of equipment and tools to be designed for executing logistical and plant processes. INVAP S.E. is an Argentine company with more than 30 years in the market dedicated to the development of cutting-edge technology, primarily in the nuclear, space, government and defense, alternative energy, medical systems, and information and telecommunication technologies sectors. It has also exported cobalt therapy equipment and automation systems for industrial projects. In the area of space technology, INVAP S.E. is the only Argentine company qualified by NASA (United States) to carry out space projects and, as such, has demonstrated its capacity for the design, construction, testing, and operation of satellites. Thanks to INVAP S.E.'s track record, Argentina is recognized today as an international benchmark in exports of nuclear installations, equipment, and control systems related to nuclear technology.
- 5.4 The Municipal Government of San Carlos de Bariloche will provide the land for setting up the fire logs production plant, located within the city's Environmental Center, a disposal facility for urban solid waste, including pruning waste. The Department of Urban Development is responsible for the management of the Environmental Center. In addition, the Social Development Branch of the Department of Social, Cultural, and Sports Development will: (a) coordinate with the working cooperatives that will operate the fire log production plant; (b) support efforts to raise the awareness of the beneficiary population and the generators of waste, through its local social outreach workers; and (c) purchase a portion of the fire logs to be produced at the plant in the context of *Plan Calor*, as the agency that manages and executes that plan in the city of Bariloche.
- 5.5 The Provincial Forests Authority of Río Negro and the group of forestry producers have expressed interest in participating in the Project, and will thus be included in the Project's governance structure through the Liaison Committee described below.

B. Implementation structure and mechanism

- 5.6 The INVAP Foundation will establish an executing unit and the structure necessary to execute Project activities and manage Project resources effectively and efficiently. It will also be responsible for submitting progress reports on Project implementation. Details on the executing unit's structure and on progress report requirements can be found in Annex VII in this operation's technical files.
- 5.7 The executing unit will consist of a Project Director to be provided by the INVAP Foundation, a Technical Coordinator, and an Administrative-Financial Officer to be contracted within the framework of the Project.
- 5.8 Governance: The INVAP Foundation will set up a Liaison Committee that will include representatives from all the Project's most important partners (the Municipio of Bariloche, the National Parks Division, the National Industrial Forest Development Branch, the Forests Division of the Province of Río Negro, representatives from the regional industrial-forestry groups, representatives from civil society and/or cooperatives of recyclers). The objective of the Liaison Committee will be to monitor the implementation of the strategy, for which purpose it will be convened at the beginning/end of each six-month period to analyze the activities plan for the upcoming six-month period and progress resulting from the completed six-month period. A Liaison Committee Manager will be appointed who has the appropriate institutional presence to work with the most important members throughout the entire Project, in order to unite behind the commitments and actions necessary for the Project's success.

VI. ATTAINMENT OF MILESTONES AND SPECIAL FIDUCIARY ARRANGEMENTS

- 6.1 **Results-based disbursements and fiduciary arrangements.** The executing agency will commit to the MIF's standard arrangements with regard to results-based disbursements, Bank procurement,¹⁷ and financial management,¹⁸ as specified in Annexes V and VI.

¹⁷ Link to [Policies for the Procurement of Works and Goods Financed by the IDB](#)

¹⁸ Link to [Operational Financial Management Guide](#)