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ARGENTINA FLOOD AND DRAINAGE PROJECT

Environmental Assessment
Executive Summary

INTRODUCTION

The Argentina Flood and Drainage Program (PIDU) will continue supporting the investment needs of participating provinces in Argentina through the implementation of well coordinated flood protection programs. This support started in 1992 with the Flood Emergency Program (PREI), which were followed in 1996 by the execution of the Argentina Flood Protection Project (PPI), and continued with an APL program. This project constitutes the second phase of the APL. These programs include structural and non-structural measures, consolidating the provincial capacity to deal with periodic flooding, protecting important economic and social infrastructure, and strengthening the legal framework to deal with flood risks. When completed the project is expected to have provided technical assistance and financing to 6 provinces. A total of 25 projects which could not be financed by the PPI were selected along the flood plain of the Parana and Uruguay rivers.

Main environmental issues associated with the project are equal to those identified for the PPI. They include potential affectation of natural habitats- , specially in and near urban areas,- and potential cumulative impacts from interference with ecological processes in the flood plains of the Parana and Uruguay rivers. Major civil works in or around urban areas have the potential for localized impacts that need to be managed to avoid disturbances to local communities. Some civil works result in displacement of low income families living in high flood risk areas. Similarly to the PPI, the project (APL2) has therefore been assigned a category A for environmental purposes.

This report summarizes the findings of (i) the ex-post evaluation of the environmental performance of the PPI; (ii) the screening, updating of environmental data sheets, and project specific environmental assessments for all 25 works included in the APL2; and (iii) relevant environmental issues included in the Regional Environmental Assessment carried out for the PPI.. This Rea is considered to be still valid and applicable to the APL2.

ENVIRONMENTAL ASSESSMENT STRATEGY

The management of environmental issues in the project will follow the highly successful experience of the Argentina Flood Protection Project (PPI). Most sub-projects included in the APL2 had already been appraised as part of the PPI,. During project preparation, the Environmental Assessment for the APL2 included: (i) an ex-post evaluation of the environmental performance of the PPI; (ii) screening and updating of Environmental Data Sheets of all sub-projects included in APL2; and (iii) preparation of an Environmental Management Plan for the APL2 based on the experience of the EMP for the PPI and the lessons learned and recommendations stemming from the ex-post evaluation of the PPI.

THE ARGENTINA FLOOD PROTECTION PROJECT (PPI)

Irregular rainfall patterns prevail in Argentina causing both, pervasive floods and droughts. About a fourth of the territory gets repeatedly flooded. This is particularly true for northeast Argentina, where three rivers cross the region and much of the landscape consists of extensive, low-sloping plains. Seven provinces are located here: Entre Ríos, Formosa, Chaco, Corrientes, Misiones, Buenos Aires, and Santa Fe. These provinces comprise almost 30% of the national territory; the last two being inhabited by nearly half of Argentina's population and an additional 12% living in the remaining five.

The project was the first phase of a two stage Flood Protection Program aimed at providing cost-effective flood protection coverage of the most important economic areas, and developing a strategy to cope with recurrent floods. It is based in a river basin wide assessment carried out under financing from the Flood Protection Project. As a result of this study, each participating province developed a Provincial Master Plan which recommends the necessary works to reduce the effects of recurrent floods.

The structural component of the project supported the priority civil works included in the Master Plans, such as raising bridges, drainage channels, embankments, and small flood control works. Secondary civil works would be considered in a future project. The non structural components targeted: (i) the development of a new institutional framework, (ii) an early flood warning system with a new hydro-metering network, (iii) upgrading flood preparedness, and (iv) capacity building. These components particularly supported the preparation and implementation of master plans for flood defense systems in areas where flood protection works are not economically or environmentally justified.

The Bank provided 200 million USD of the total project costs which amounted to 488 million USD, 76% for structural measures, 24% for the rest including 3.6 million USD for environmental programs exclusively. Approved in December 1996, the project is expected to close by December 2005.

Minimizing interference: A Regional Environmental Assessment (REA) for the Parana/Paraguay Flood Plains

The aim of the REA (one of the first REAs in Latin America) was to protect as much as possible the integrity of the wetlands and floodplains by minimizing human interference. Its main objectives were: (a) to identify the most relevant environmental features of the river basins in order to understand the interaction between natural and anthropogenic systems, and (b) to assess a cumulative impact of the flood protection works. Thus the REA had 3 major components: (i) a regional assessment to characterize the region; (ii) a regional, integrated analysis of the cumulative impacts of the civil works, based on the standard environmental assessments for each subproject, and (iii) a regional action plan comprised of environmental programs that address region-wide weaknesses.

Regional Environmental Conditions

The regional assessment improves the baseline knowledge of the ecology and dynamics of the riverine and floodplain ecosystems: The following conditions prevail across the region:

i system stability depends on preserving natural interactions between floods and habitats;
ii threats to biodiversity include: encroachment, illegal hunting, clearing, urban sprawl and infrastructure interfering with natural flood processes, and pollution of small rivers from untreated sewage/ industrial effluents;
iii population on riverine areas have adapted to floods; urban and periurban areas are ill prepared;
iv deficient water supply, sanitation and solid waste management;
v poor coordination and heterogeneous environmental criteria throughout region;
vi lack of systematic procedures. to deal with environmental issues and floods.

This characterization of the environmental conditions was useful to improve the design of environmental criteria for both site selection and site specific engineering works. A strong participatory approach was promoted throughout the project, with individual project designs being modified following suggestions from local communities and NGOs.

Natural Habitats Issues

The environmental assessment also recognized that the construction of hydroelectric projects in the upper basins of the rivers has probably also impaired natural ecological resources and processes significantly.

Lack of environmental awareness and understanding of ecosystem functions throughout institutions and the communities, made it a priority to improve baseline knowledge of the ecology and dynamics of the riverine and floodplain ecosystem.

The low percent of the national territory included in protected areas also meant that the protection and management of wetlands within the project region, and especially around urban areas, needed to be specifically addressed.

Approach to solving issues - Environmental criteria for civil works

The environmental assessment had three major components: a Regional Assessment to identify the most relevant environmental features of the rivers floodplains; project specific assessments for each of the priority subprojects and an integrated analysis of all priority projects and their cumulative impacts at the regional level. The overriding environmental goal was to protect as much as possible the integrity of the wetlands and floodplains by minimizing human interference.

The Regional Environmental Assessment screened subprojects for works that protected economically important infrastructure from floods, did not promote urban expansion in high flood risk areas, and had minimum interference with natural flood processes and minimum effects on sensitive ecosystems. Wetlands were specifically avoided and no projects were located within critical habitats. The 51 subprojects chosen were those where (i) the civil works did not alter the structure and functioning of floodplain habitats and surrounding wild lands; and (ii) obtaining a return rate higher than 12%. Finally, to allow all provinces to participate, the investment in each province was set according to its counterpart funding capacity

Standard environmental assessments were conducted for each subproject, albeit their scope was narrow due to the pre-screening. Based on the level of their impacts the individual projects were categorized, both before and after mitigation measures, as critical, important, moderate, or minimal. Only projects with minimal impacts were selected for the most part, although some with moderate ones were included. This in itself was a built in safeguard that considerably reduced impacts throughout the basin.

The individual projects, though engineered as flood defense works, were incorporated into the urban landscape to provide open spaces for recreation. For example, the linear park in Concordia along Arroyo Concordia, and the square in the city of Concepción del Uruguay along the Las Animas Creek are the result of recovering areas previously lost because of poor drainage in urban creeks.

The REA concluded that with appropriate mitigating measures, there would be no regional environmental impacts due to the localized nature of the works; these were mostly limited to urban and suburban areas where natural habitats had already been either converted or degraded.

Maximizing Benefits: Regional Environmental Programs

In response to the environmental issues raised by the regional assessment, the REA included a regional action plan. The plan comprises four environmental programs designed to address institutional weaknesses in

communities affected by recurrent flooding, further supporting the new institutional framework set forth as part of the project. A total of US$3.6 was allocated for these programs which will improve environmental assessment, management, protection, and education.

The *Program to Strengthen Environmental Assessment Procedures in Key Institutions* aimed at the emergency response coordinating subunits, provincial environmental and natural resources agencies. Its purpose is to improve their environmental capacity for flood protection works and to ensure environmental assessments explicitly address impacts on floodplains.

Decreasing flood impacts in urban settings is a challenging task. The *Program of Technical Assistance for Urban Environmental Management* involves municipalities and NGOs, and addresses the lack of sufficient urban environmental infrastructure and technical solutions to deal specifically with flood related problems. All participating localities will develop Urban Area Management Plans which will encourage settlement out of the floodplains and into planned development areas. Flood risk zoning maps were prepared for all urban sites; new regulations will restrict settlement in flood prone areas.

Environmental Education and Awareness Programs were set up at each of the 51 sites where civil works were located, as well as throughout the provinces involved. This extended the educational program outside the immediate area of influence of the works. The environmental education programs informed people of the importance of floods in natural habitats, maintaining flood plains, the consequences of impervious areas (mainly paving and house building), and better land use practices.

Program for Wetland Protection and Management. There are few protected areas and a lack of effective protection systems throughout the region. The degradation of wetland and floodplain ecosystems was common throughout, but especially true around urban areas.

At a local level the program support initiatives for protection and management of wetland and other ecosystems. Multiple institutions participate: provincial natural resources agencies, research institutions, municipalities and NGOs. Tye creation of a Biosphere reserve around the city of Formosa, supported by the project, is to be highlighted.

Wetlands in wich work was done under the PPI

Name	*Number*	*District*	*Province*
Lagunas Avalos, Prosperidad, Rissione, Francia, Los Teros, Argüello, Colussi, Navarro, Fortín	9	Metropolitan Area of Gran Resistencia	Chaco
Laguna Seca Lagunas Barrios Mataderos y Bosco	3	Corrientes Goya	Corrientes
Arroyo Concordia Río Gualeguay Arroyo Las Animas	3	Concordia Gualeguay C. del Uruguay	Entre Ríos
Arroyo Yarará	1	Puerto Esperanza	Misiones
Laguna Guadalupe	1	Santa Fe	Santa Fe
Lagunas Oca, Indios, Siam, Martín García	4	Formosa	Formosa

As a result of the implementation of Environmental Programs, of a regional outlook on the problematic of flood plains management and of adequate supervision and coordination of all these, a citizens' awareness program was promoted in all provinces of the basin about the consequences of indiscriminate occupation of areas in the flood valley, which are natural drainage for rainwater. A **Law on Land Use** was sanctioned in each one of the seven provinces in the river basin, which establishes among other elements, restriction strips in regards to water risk. According to said legislation, **Municipal Ordinances in 18 municipalities** were sanctioned in the same spirit as the regional legislation.

Land Use Plans/Legislation Supported by the Project

Province	Location	Legislation or plan
BUENOS AIRES		
	Campana	Decree Nº3688/99 Restricts construction by contour level
	Zárate	Decree Nº3177/99 Restricts construction by height (?)
CHACO		
	Floodplain occupying the entire province	Resolution Nº1111/98 Restricts construction according to risk level
	Gran Resistencia metropolitan area	Resolution Nº1111/98 Restricts construction according to risk level
	Resistencia	Decree N° 5.403/01 Restricts Impermeability
		Decree N° 1.095/01 Governor declares the Environmental Improvement Plan for Lake Prosperity of provincial interest
ENTRE RIOS		
	Concepción del Uruguay	Decree Nº4110/96 Restricts construction by height (?)
	La Paz	Decree Nº458/98 Restricts construction on the northern shore
	Concordia	ResolutionDRH N°16/97 Establishes Riparian Border along the banks of the Concordia Stream Regulation Nº30238/98 Prohibits construction along the linear park Regulation N°32078/01 Prohibits construction along the Arroyo Las Animas Park Regulation N°32253/02 Restricts construction according to level of hydrologic risk
SANTA FE		
	Santa Fe (capital)	Regulation N° 10612/00 Adheres to the Use of Soils Law
	Villa Eloisa	Regulation Nº164/98 Restricts construction according to level of hydrologic risk
	Cañada de Gómez	Regulation Nº3855/98 Restricts construction according to level of hydrologic risk
	Cañada de Gómez	Regulation Nº4327/01 Prohibits construction in affected zone
	Rafaela	Regulation Nº3212/98 Restricts construction according to level of hydrologic risk
MISIONES		
	Posadas	Regulation N° 989/03 Adheres to the Use of Soils Law
CORRIENTES		
	Corrientes (capital)	Resolution Nº320/ Defines Riparian Border
	Goya	Regulation N°1117/02 Prohibits construction without defense of construction area
		Regulation N°1130/02 Restricts construction according to level of hydrologic risk
		Regulation N° 1233/04m Declares the Lakes Recovery Plan of municipal interest
	Mercedes	Regulation N° 596/05 Creates reserve area within 10 m of the 3 principal streams

In spite of the financial deductions made, owing to the default declared by the country and the reallocation of resources made by the Nation, the program (i) fostered, in all 7 provinces of the river basin actions of environmental training and education; (ii) was successful in the environmental integration of the subprojects; (iii) promoted citizens' participation; (iv) developed and disclose tools for environmental diagnostics; (v) introduced risk management in the agendas of officials and citizens; and (vi) created a new framework of norms oriented to restrict the occupation of areas under floodrisk; (vii) strengthened the capacity to manage flood contingencias

Contingency Plans Developed Under the Project

Province	***Type of document or plan***	***location***
Buenos Aires		
	Formulation of Risk maps of the project areas of intervention	Consists of the areas of San Fernando, Tigre, Escobar, Campana, Zárate, Baradero, San Pedro, Ramallo and San Nicolás
Chaco		
	Contingency Plan for Flood Emergencies including the strengthening of community organizations in risk perception	Metropolitan area of Gran Resistencia (includes the municipalities of Resistencia, Fontana, Puerto Barranqueras, Fontana and Tirol)
Corrientes		
	Contingency Plan for Flood Emergencies	City of Goya
Santa Fe		
	Contingency Plan for Flood Emergencies	City of San Javier
	Contingency Plan for Flood Emergencies	City of Melincué

Successful strategies

The regional approach provided sufficient background information to develop general environmental criteria that would allow an expedient classification and prioritization of potential sites for the project. This approach allowed for site specific works while evaluating their cumulative impact at a regional level. The regional approachIt also allowed the identification of areas of high biodiversity, distribution of species of concern and types of habitat. This is a significant contribution towards increasing the currently low percentage of habitats in protected areas throughout the country.

Minimum interference and effects as a goal translated into strong environmental criteria for the civil works. This proved to be a cost-effective way to screen projects and also acted as a safeguard to minimize cumulative impacts on the river basins.

Consulting communities on the planned civil works allowed for input that resulted on the improvement of individual project designs

Coordinated environmental programs allowed a multidisciplinary approach towards improving the existing conditions at the project sites. The works provided immediate defenses against floods and improved conditions, urban plans, environmental assessment and education will prevent conditions from deteriorating.

One of the most profound changes a project can have is within the regulations and laws of a country which mandate higher environmental safeguards and standards. Within this project regulations and programs at the state and municipal level ensure among other things that: (i) the flood risk of an area is assessed prior to construction; (ii) environmental assessments explicitly address impacts on floodplains; (iii) urbanization of floodplains is avoided; (iv) protected areas that preserve ecological functions of wetlands. It is significant to note that 15 municipalities in 4 provinces have taken on the initiative of implementing regulations, and steps towards flood protection similar to those set forth by the project.

Lessons learned from the PPI

The identification of adverse impacts from the execution of EAR works and PAR implementation has made it possible to integrate mitigation measures, which must be carried out not only before and during the execution of each subproject; but also after their completion; something the project did not contemplate.

- The functional relationship SUCCE-SUPCEs has contributed to the application of criteria and methodologies that, albeit common to the 7 provinces of the river basin, are adjusted to the particularities of the various territories included. In this sense, SUCCE's supervision and technical coordination and management was essential to reach a common strategy; but at the same time was flexible enough to adapt to the environmental and institutional reality of each province.

- Actions of environmental improvement were implemented in the municipalities where the work enhanced the living conditions of the **most vulnerable population,** who is precisely the most defenseless in environmental problems.

- The practice of holding Public Hearings in all the districts included in the work resulted in minimizing local conflicts about works that in most cases have a significant urban impact.

Recommendations for the APL2

In the light of the outstanding results obtained so far, it is recommended that the **Urban Flood Prevention and Drainage Program (PIDU)** be continued, with the programs and subprojects in the provinces that have participated in PPI, and especially to complete and/or complement them in those districts where tasks may be still pending, at project or work level, structural or non-structural measures.

Also recommended is the elaboration of an **Environmental Manual,** which should be available before starting the project, and which shall form part of the terms for opening a bid for the subprojects. On the other hand, our proposal is that the contractors, before starting their work, should submit an **Environmental Management Plan (EMP),** which shall be approved by SUPCE and SUCCE. Said PGA shall be updated every two months according to the physical progress of the subproject.

URBAN FLOOD PREVENTION AND DRAINAGE PROJECT

The Urban Flood Prevention and Drainage Project (PIDU) is a continuation of PPI inasmuch as it contemplates the implementation of structural and non-structural measures which had not been implemented owing to financial deductions made at the time. The Project shall seek to prevent and, eventually, mitigate the damage caused by floods in urban centers of Argentina, through the combination of structural and non-

structural measures. Its integral approach aims at improving, on the one hand, drainage and protection conditions, and on the other, at promoting citizens' awareness of the consequences of the indiscriminate occupation of areas that are natural drainage for rainwater. The Project implementation will improve the capacity of each province to face periodical flooding, protect important economic and social infrastructures, and strengthen the legal and institutional systems to sustain said measures.

Owing to the excellent performance and results achieved by the environmental component of **PPI**, a similar criterion has been proposed for **APL2,** to enable it to further achievements and extend the notion that non-structural actions undertaken at regional level (environmental programs, citizens' participation, institutional framework and risk management) constitute the main pillar of a management policy for the flood valley. On the basis of what was done at **PPI,** the results obtained, the lessons learned and experience gathered, the **URBAN FLOOD PREVENTION AND DRAINAGE PROJECT (PIDU),** which comprises the management of the Paraná, Paraguay and Uruguay basins, will include **Structural and Non-Structural Measures.**

Structural Measures

They consist mainly of two groups of measures: (i) defense works against floods in urban areas with high vulnerability to flood damage and important economic activity; and (ii) pluvial drainage works aimed at reducing the area affected by rains. The lists of works to be executed as part of the Master Plans timely formulated by the Provinces, were made on the basis of technical, economic and environmental criteria, considering: (i) the protection of important economic assets; (ii) obtaining a rate of return over 12%; (iii) the non-promotion of settlers in areas of water risk; and (iv) the least interference with natural flood processes.

The main categories of civil works include (i) construction, rehabilitation and conditioning of embankments; (ii) conditioning of urban and periurban channels through dredging, rectification, cleaning or pumping stations; (iii) stream training in urban areass; and (iv) conditioning or replacement of bridges.

Environmental Management Plan for the APL2

Due to the fact that Regional Strategic Environmental Evaluation was performed during the formulation of PPI, complemented by Environmental Impact Studies (Sp.EIA), for nearly all the works identified by the Project of Flood Prevention and Urban Drainage, these works have their own Environmental Evaluation.
To formulate PIDU, the strategy consisted in: (i) revision and adjustment of the EIAs made for each work, recorded in file-cards for Environmental Impact Evaluation for Specific Projects; and (ii) updating and homogenizing the Environmental Impact Studies, contemplating all the subprojects to be included in the Project of Flood Prevention and Urban Drainage, by means of a Matrix common to all. This strategy made it possible to identify the impacts associated with each work and the mitigation measures to be included during the construction and operation of the subprojects.
From the studies, it has been concluded that the impacts identified are mostly highly localized and only for a short time.

The main environmental criteria for the evaluation of the works were: (i) the conservation and restoring of the water basin in all possible cases, so as to reach conditions of environmental quality that will favor its public use and the development of aquatic biota; and (ii) non significance interference in the natural flood processes.

Table 7. Summary of the environmental measures proposed for Project works

Province	*Location*	*Subproject*	*Method of mitigation*
Corrientes	Goya	Permanent protection works	Landscaping, hillside protection,, construction of canals at the foot of the

			embankment, canal maintenance activities, wetlands restoration
Chaco	Resistencia	Storm drainage on Los Hacheros Street, V. Sarfield Ave and Canal Clayton Basin	Maintenance, removal of underwater lake vegetation, RSU Management Plan, ,Nutrient contribution and contaminant control plan
		National Sovereignty Control Works	Landscaping, hillside protection, construction of canals at the foot of the embankment, canal maintenance activities, wetlands restoration
		Lake Avalos pumping station	Maintenance, removal of underwater lake vegetation, RSU Management Plan, ,Nutrient contribution and contaminant control plan
Entre Ríos	Concordia	Coastal restoration and storm drainage	Maintenance, RSU Management Plan, ,Nutrient contribution and contaminant control plan
	Diamante	Stabilization of steep embankments	Landscaping, hillside protection, RSU Management Plan, Maintenance,
	La Paz	Control of river embankments	Landscaping,, hillside protection, RSU Management Plan, Maintenance,, plan de conexiones cloacales, pavement of roads and gutters for drainage enhancement
	Victoria	Water sanitation protection	Sewage control plan, maintenance,
Misiones	Puerto Esperanza	Systematization of A° Yarará	Restriction of occupation and prospecting on arqueological sites, RSU Management Plan, maintenance, landscaping
	Puerto Iguazú	Systematization of A° Tacuara	Restriction of occupation, RSU Management Plan, maintenance, landscaping
Santa Fe	Gálvez	Improvement of Los Llanos canal	Signage, RSU Management Plan, maintenance
	Las Rosas	Improvement of Las Estacas canal	Signage, RSU Management Plan, maintenance
	Rosario	Saladillo waterfall stabilization	Signage, maintenance
	RP 3	Bridge improvement	Maintenance, pillar protection, hillside stabilization
	RP 82 S	Bridge improvement	Maintenance, pillar protection, hillside stabilization
	Santo Tomé	Storm drainage	Signage, RSU Management Plan, maintenance

Although the impacts on natural ecosystems were deemed negligible, the Project will finance programs to improve environmental monitoring, the management of humid urban areas – especially those threatened by human activity – and the management of urban solid waste.

Based on the findings of the ex-post environmental evaluation an updated and enhanced Regional Environmental Management Plan has been prepared for the APL2. This EMP includes: (i) provision for a more selective approach to rapid Urban Environmental Assessments in priority municipalities; (ii) supporting solid waste management in cities included in the project as a means to achieve sustainability of drainage infrastructure supported by the project; (iii) increasing environmental enhancement opportunities of infrastructure projects, especially linear parks which have received high levels of acceptance among participating communities in all provinces; (iv) continuing support to urban wetland restoration and conservation efforts in selected communities; (v) environmental education programs; and (vi) updating the environmental construction manual that was applied during the PPI.; and (viii) Contingency Plans for Water

Emergencies, on the basis of the experience started with PPI, which will have local or provincial scope, as well as the training of Organisms in charge of the emergency. In addition to the EMP, a resettlement framework and project specific resettlement plans for first year sub-projects have been prepared;

Implementation Arrangements

On the basis of the foregoing outline, that cover all the said spectrum of the Management Plans, both referring to its creation and instrumentation, as well as to their execution, application and compliance control; it is recommended that an appropriate and competent implementation unit in every jurisdiction, coordinated with the local institutions at corresponding levels, with the monitoring at central level aimed at homogenizing the creation and execution of norms, as well as managing national and international budget and credit allocation where relevant.

It is important to consider that non-structural measures constitute environmentally positive actions because they do not seek to modify the natural water régime. Within that context, zoning and land use regulation according to flood risk is part of the appropriate environmental context, that may become a central instrument of the **national environmental management** and warrant its intervention.

Institutional Aspects

In the light of actions taken so far and of the experience developed, it is deemed convenient to maintain a central coordination unit that could enjoy the necessary autonomy, so as to guarantee its proper performance. The final result would be that, at the top of the planned structure, **Environmental Risk** would be placed as a key issue, in accordance with the occurrence of floods and the collateral actions previously referred to.

Public Consultation

During the preparation of the Project, **22 Public Consultations meetings** were held, which helped to comply with tight chronogram of activities, thanks to which, within a period of 30 days the subprojects identified in the PIDU, the associated impacts and planned mitigation measures were submitted in 22 districts. As a conclusion of those public presentations, it can be asserted that there is no opposition to the implementation of the works, but rather a great interest in their prompt execution.

The EA report was presented to local institutions and NGos in regional workshops. Project specific consultations were carried out in all communities with civil works under the APL2 project. The EA report is available in the SUCCE in Buenos Aires and in all provincial offices (SUPCES) in the region. An executive Summary in English was also prepared and sent to the Bank. The project's EA was reviewed by the Regional Safeguard team.