4. ENVIRONMENTAL CONSIDERATIONS

4.1 METHODOLOGY

The preliminary environmental assessment presented in this chapter focuses on the following aspects in order to establish a comparison between the three sites included in the study:

- Bathymetry and riverbank erosion;
- Sediment quality;
- Shoreline physiography;
- Presence of sensitive elements in the vicinity of project sites;
    - Riparian vegetation (marshes)
    - Wildlife habitats (fish, birds, marine mammals)
    - Rare wildlife or vegetal species
- Compliance with regional land use master plans
- Integration of project in local landscape
- Acceptability to local populations

4.2 VILLE GUAY

4.2.1 Physical Environment

Shoreline Erosion

The study sector presents abrupt, high rocky cliffs with a gently sloped bench above the river. According to Argus (1996b), the coastlines of the study sector are natural and stable.

Environment Canada (1996) has identified the sector as a depositional-erosional sediment zone that is uncontaminated (by mercury, mirex, PCB and PAH) and not likely to contain pollutant deposition and accumulation zones.

Advantages
Stable profile, neutral sediment balance

4.2.2 Biological Environment

Riparian Vegetation

The coastlines of the study sector are not suitable for the development of riparian vegetation (due to the presence of bedrock and large boulders). Contiguous intertidal marsh areas are not seen within this sector. In several locations along the length of the littoral, one can observe small islands of vegetation typically associated with the intertidal zone, although the main water-plant communities of the sector are found at Anse aux Sauvages and Anse Gilmour located 6.5 km and 6.0 km, respectively, upstream from the study sector. These consist of beds of American bulrush (*Scirpus americanus*) typical of Quebec City region. The intertidal beds are well structured and well diversified. In total, 45 plant species have been inventoried here, including three considered endangered or at risk as defined in the Act respecting Threatened or Vulnerable Species[1] (Robert Hamelin & Associates, 1994).

No systematic inventory of the river shoreline vegetation has been performed with the intention of identifying and locating all vulnerable or threatened species. However, information from Quebec's natural heritage data centre[2] (CDPNQ) mentions seven (7) occurrences of fresh-water plant species that are threatened or at risk in the Ville Guay sector (3 km upstream from the study sector).

Fish

In the Quebec City-Levis study sector, fish are represented by 71 species belonging to 23 different families. The sector serves as a migratory route for several anadromous and catadromous species.

More specific to the study sector, information from the Ministry of the Envvironment (MENV) SIFA database, summarizes the status of twelve fish species for the Anse aux Sauvages – Pointe de la Martinière sector (Harvey *et al*. 1995), consisting of three inventory segments situated such that their downstream limit is located in the centre of our study sector:

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[1] *Loi sur les espèces menacées ou vulnérables du Québec*

[2] *Centre de données sur le patrimoine naturel du Québec: CDPNQ*

1. Yellow perch
2. Banded killifish
3. Alewife
4. White sucker
5. American shad
6. White perch
7. Rainbow smelt
8. Northern sucker
9. Fallfish
10. Northern pike
11. Spottail shiner
12. Walleye sp.

In the downstream segment (the one containing the upstream part of our study sector), a **fry-rearing** habitat was identified for four species: sucker sp., yellow perch, rainbow smelt and American shad. Mousseau and Armellin (1995) further noted that the sector is also a fry-rearing habitat for alewife and white perch.

A few sites along Pointe-de-la-Martinière (2.5 km upstream) and Anse aux Sauvages (6.5 km upstream) exhibit some characteristics needed for the **reproduction** of three species: American shad, white perch and rainbow smelt. So far, no reproduction area has been positively confirmed in this zone.

On the other hand, Guy Trencia of FAPAQ suggests that the rainbow smelt may use the estuary of Lallemand brook (3 km west of the study sector[3]) for reproduction. The FAPAQ has reported a spawning zone used by the smelt in the Église Brook (near Beaumont, some 8 km east of the study area). Mousseau and Armellin (1995) also mapped the Saint-Claude, lÉglise and Labrecque brooks (located at 7, 9 and 10 km downstream from the study sector) to include the actual spawning grounds of the rainbow smelt.

[3] from the center of the study sector

The eel, allis shad and Atlantic tomcod are fished commercially and recreationally. These species migrate through the sector. The Atlantic tomcod passes through, on the north bank of the estuary, in November-December. Smelt also use the north bank of the estuary, but in April-May. Allis shad migrate in April along the estuary's south bank. And eel migrate towards the end of September, also using the south bank.

An established fishing zone is located at the western end of the study sector.

Marine Mammals

By definition, marine mammals do not frequent the fresh waters of the Saint Lawrence Seaway, although according to Environment Canada occasionally summer tourists do go looking for them there (1996).

Birds

The Quebec City-Levis study sector contains more than 300 bird species.

The low density of marshlands in the Ville Guay sector means that it contains no habitat suitable for sheltering migrating birds, although one occasionally observes gatherings of diving ducks and shorebirds.

Between Quebec City and St-Michel-de-Bellechasse, the zone most used by avian fauna (geese, migrating ducks, shorebirds) is Anse aux Sauvages. Its water-plant communities represent an en-route staging zone for migratory waterfowl. Canada geese and tip-up ducks visit this area occasionally during their spring and autumn migrations. Note that the aquatic riverbank bird inventories conducted by MENV and SCF demonstrate that Anse aux Sauvages seems to serve as a waterfowl concentration or gathering area[4] (ACOA) as defined in the *Regulation respecting Wildlife Habitats under the Act respecting the Conservation and Development of Wildlife.*

The Bellechase RCM has identified a migratory bird staging zone to the east of the pylons.

Lehoux and de Repentigny (1987) do not consider the sector to be a concentration area for migratory waterfowl that would be threated by development.

[4] *aire de concentration d'oiseaux aquatiques: ACOA*

Advantages

No sediment depositional zone, so riparian habitats have not developed

No specific zone used by marine mammals

The study sector is neither a waterfowl concentration area, nor a gathering site for at-risk migratory waterfowl

Disadvantages

Water-plant communities of American bulrush located about 6.0 km upstream from the study sector

Seven occurrences of threatened or at-risk plant species were surveyed at 3 km and three others at 6.5 km upstream from the study sector

Fry-rearing habitat for six species, 2 km upstream

Potential reproduction habitats for three fish species at Ville Guay (2.5 km upstream) and at Anse aux Sauvages (6 km upstream)

Potential reproduction habitats for the rainbow smelt at 2.5 and 6.5 km upstream from the study sector

Confirmed smelt spawning zones from 7 to 10 km downstream from the study sector

Migratory corridor for eel and shad

Anse aux Sauvages is a waterfowl concentration area (6.5 km upstream)

Staging zone for migratory birds located 2 km downstream

No concentration area for at-risk migratory waterfowl nearby (the closest is 6 km north)

4.2.3 Human Environment

Local Land Use

The study sector is located at the eastern limit of the Lévis RCM, next to that of Bellechasse. The RCM development plan (MRC Desjardins, 1992) assigned an industrial-port land use to the study sector, which means the methane tanker terminal project would be authorized for this location.

The Bellechasse RCM (revised in April 1999) identified the western river portion of its territory (which neighbours the study sector) as an "ecologically valuable territory" of medium value, which was however augmented by an exceptional panoramic view visible from Route 132 (Isle d'Orleans, the Laurentian plateau, St. Lawrence seaway).

Parent and Rochefort (1994) refer to a landscape unit of moderate value: conservation zone, interesting views, strong harmony and integrity, in other words, associated with heightened sensitivity. Regarding the potential development of port infrastructures (deep water wharf), the authors suggest that the preferred method would be to analyze the capacity for landscape integration: that is, the intrinsic capacity of the environment to accommodate a new feature without transforming its special character. Integrating the project should not disturb the general landscape.

Water Intakes and Effluent

According to Roche (1986), the study sector between Davie and the pylons contains the only water intake, which is used by the town of Lauzon and is located near the Davie facilities (7 km west of the study sector), as well as four small outfalls between Davie and Gilmour beach (6 km west of the study sector).

Archeological Resources

No archeological site is known to occur in the study sector (Roche, 1986). Vestiges of the Gilmour quay at Anse-aux-Sauvages are representative of 19th century port infrastructure, but only traces remain. Parent and Rochefort (1994) identified an eel weir (considered a natural resource) in the study sector, but west of the proposed site.

Socio-Economic Aspects

For several years, the development of industrial-port facilities on the south shore of Quebec City has been considered a priority for the economic development of the Quebec City and Chaudière-Appalaches regions. Since the 1970s, the capacity of industrial-port development to drive the regional economy has been noted in several planning studies. This industrial park and port development project received the unanimous support of regional stakeholders at the socio-economic conference of Chaudière-Appalaches held in 1990. The Quebec City and Chaudière-Appalaches regional development boards (CRCD[5]) have also identified the project as a regional

[5] *conseils régionaux de concertation et de développement: CRCD*

priority. Analyses performed to date show that the Ville Guay site represents one of the only locations still available for the development of industrial-port facilities on the south shore of the Saint-Lawrence between Lévis and Cacouna. This site could provide the region with a significant competitive advantage (Roche 1997).

Developing the industrial-port project is viewed as a key step by economic development stakeholders in the Chaudière-Appalaches region; they believe this project will encourage and facilitate the growth of "big business" in the region (ZIP Québec 1993).

Advantages
Use authorized by the development plan
Closest water intake is 7 km upstream
Disadvantages
Exceptional, highly sensitive panoramic view
Territory located to the east has been defined of ecological interest for the neighbouring RCM
Eel weir in the study sector, although west of the proposed site

4.3 POINTE-SAINT-DENIS

4.3.1 Physical Environment

Shoreline Erosion

The south shore of the upper estuary cuts through sedimentary rocks of the Appalachian zone. The regular coastline is edged by a wide rock bench. The development plan (MRC Kamouraska 1987) notes that Anse-aux-Iroquois is a sector that suffers from erosion. Veilleux (1992) indicates that the sector west of Pointe-aux-Orignaux is particularly sensitive to erosion. It seems reasonable to consider that this issue is present in the study sector. The ZIP for the southern portion of the estuary does not mention this issue in its publications, including its ecological action and rehabilitation plan (PARE[6]). However, it does mention the fact that the typical characteristics of each portion of the estuarian littoral are not well known, including the locations of sensitive

[6] *Plan d'Action et de Réhabilitation: PARE*

habitats, zones of potential erosion; a characterization project covering the south shore of the estuary was recommended.

Detailed analysis using aerial photography would allow us to come to some firmer conclusions about the zone proposed for the LNG facility.

Advantages
Low relief
Disadvantages
River profile potentially unstable

4.3.2 Biological Environment

Riparian Vegetation

According to Létourneau (1996), the coves of Pointe-aux-Iroquois, Pointe-aux-Orignaux and Pointe-Saint-Denis contain a *Spartina* marshland, ranging from a high-water marsh of saltmeadow grass (*Spartina patens*), to a coastal low marsh of saltwater cord-grass (*Spartina alterniflora).* A discontinuous band is also present on the north shore.

Information obtained from CDPNQ does not mention any rare or threatened plant species in the study sector or nearby.

Gagnon (1998) mapped the main intertidal marshes on the south shore of the estuary; the closest to the study sector are Anse Sainte-Anne (about 15 km upstream) and Seigneurie de Kamouraska (20 km downstream).

Fish

In the upper estuary, the typical marine and brackish-water species such as capelin, herring, plaice and lumpfish are found everywhere. Ghanimé *et al*. (1990) in Environment Canada (1996) report five fresh-water species and 15 salt-water species. The ichthyological communities of the upper estuary are dominated by migratory fish. The most abundant, the smelt and tomcod, spawn upstream from the marshland. Smelt spawns in the Ouelle River (7 km west of the study sector) and herring spawns at the mouth of the river.

This sector contains an abundance of eel, smelt, tomcod and capelin (Marsan 1989). Shad and eel also migrate through the zone, using the southern shoreline of the estuary.

The Ouelle River, located 7 km upstream from Pointe-Saint-Denis, is the only one identified as an Atlantic salmon river in the upper estuary sector (Gagnon 1998). The American eel is also found there.

This sector contains established eel weirs. Between Pointe aux Iroquois and Cap au Diable, the marine map indicates a dozen such sites.

Marine Mammals

Eight marine mammal species live in the upper estuary at various times during the year. They are primarily concentrated in the downstream portion of the upper estuary.

However, further upstream in the upper estuary at a distance of about 2 km from the study sector, there is a zone used intensely by pods of young and adult beluga whales. Downstream, there is another zone of intense use opposite the Kamouraska archipelago (about 10 km downstream from the study sector), which is also a haulout or ledge used by harbour seals (Gagnon 1998). The species produces young in May-June.

Birds

Over 350 species of birds live at various times during the year in the upper estuary (Gagnon 1998).

The study sector is 9 km upstream from a colony-nesting site (with a population of between 100 and 999 pairs) at Kamouraska Bay; common eider duck, herring gull and great black-backed gull are present there (Gagnon 1998). The area serves as a staging site for Canada geese (with between 100 and 499 individuals/km of shoreline) and in the springtime, the snow goose (Gagnon, 1998). A no-hunting zone (ZIC[7]) (known as Saint-Denis-de-Kamouraska) was created here to provide migratory waterfowl with flyby sites (no hunting allowed) during the hunting season (Gagnon, 1998)

The American black duck also uses the marshlands of the sector.

[7] *zone d'interdiction de chasse: ZIC*

Pointe aux Iroquois, Pointe-aux-Orignaux (study sector) and Anse Saint-Denis (3.5 km east of the study sector) coves represent migratory waterfowl concentration areas (tip-up ducks and geese), which are placed at risk by development in the Saint-Lawrence corridor. Their value is deemed to be high; even superior, in the case of Anse Saint-Denis (Lehoux and de Repentigny 1987).

Advantages
No mention of threatened or at-risk plant species
Disadvantages
Presence of intact, continuous saltwater marshes
Smelt and herring spawning zone in the Ouelle River (7 km upstream)
Migration of shad and eel along the riverbank
Ouelle River is the only Atlantic salmon river in the upper estuary (7 km upstream)
Zone frequented by beluga, at a distance of 2 km
Harbour seal ledge 10 km downstream
9 km downstream, Kamouraska bay (bird colony site, hunting prohibited)
Concentration sites for at-risk migratory waterfowl at Pointe-aux-Orignaux (high value) and 3.5 km downstream at Anse Saint-Denis (superior value)
Several established eel fishing sites

4.3.3 Human Environment

Local Land Use

The study sector is contained within the territory covered by the Kamouraska RCM. On the development plan, Pointe-aux-Orignaux is mapped as a site of esthetic and ecological interest. The Ouelle River and its spawning grounds are designated as protected areas.

Water Intake and Effluent

The development plan does not mention any.

Archeological Resources

The development plan does not mention any.

Socio-Economic Aspects

The development plan notes that the regional economy is largely dependent on primary resources, particularly agricultural, and that regional tourism potential could be developed. On a regional scale, the demographics are characterized by low birth-rates and an aging population, although the total number of households is expected to increase. The local people use and depend upon the services and employment opportunities available within the La Pocatière/Saint-Alexandre axis. The RCM's three objectives are to:

- ensure the protection, conservation and even the improvement of the quality of the environment;
- support the expansion of socio-economic and regional roles;
- help meet the community's needs.

Ultimately, none of the sectoral guidelines consider a project such as a methane tanker terminal.

<u>Advantages</u>
<u>Disadvantages</u>
Pointe-aux-Orignaux has been mapped as a site of esthetic and ecological interest on the development plan.
Natural river landscape
Complete protection of the Ouelle River and its spawning grounds in the development plan
No guidelines for industrial-port development in the development plan

4.4 GROS CACOUNA

This last site is 12 km from Rivière-du-Loup, on the western side of Gros Cacouna Island, which rises to 89 m in elevation (Pelletier *et al*. 1990).

4.4.1 Physical Environment

Shoreline Erosion

Dryade (1986) has identified a crumbly cliff in the study sector.

Advantages
A number of changes have occurred since 1965
Disadvantages
Crumbly cliff

4.4.2 Biological Environment

Riparian vegetation

Letourneau's maps (1996) show a mosaic of vegetation habitats in the entire southern and eastern sector of Gros Cacouna Island. Downstream and upstream, there are wet meadows, salt herbaceous meadows, marshland with salt meadow grass and alternate flowered Spartina, focus grass beds and sea cabbage beds. The northwestern part of the island, however, has none of this vegetation. The Gors Cacouna salt marsh presents a succession of parallel strips of vegetation on the shoreline based on the species' tolerance to immersion in water (Gagnon 1998). According to UQCN (1988), this wet land, which is under federal jurisdiction, should be protected (Canadian Wildlife Service). The Gros Cacouna marshland covers approximately 120 ha, extending 2.5 km from the river bank.

The width of the intertidal zone linking the island to the mainland varies from 500 m on the northeastern end to 1 km at the port site.

Information from Quebec's natural heritage data centre (CDPNQ) mentions the occurrence of Gaspé Peninsula arrow-grass (*Triglochin gaspensis)* in the Pointe Morency marsh, located more than a kilometer from the eastern end of the island.

A number of changes to the littoral area in the sector have occurred as a result of the installation of Gros Cacouna port facilities. Most of the work was done between 1965 and 1979. A total of 4,474,000 m^3 of sediment was dredged then dumped in deep waters (Anonymous1981 in Pelletier *et al* 1990), or in land disposal sites.

Indirectly, the port structures caused changes in the hydrodynamic and sediment regimes. Dredging inside the port area and in the approach zones changed the nature and morphology of 0.63 km^2 of the substratum. The main impact of port construction was the loss of 1.08 km^2 of intertidal marsh. Physical-chemical changes caused by the confinement of this zone led to a drastic change in the composition of the species present. Disturbances also destroyed the habitat of certain fish species, invertebrates and aquatic birds.

Fish

Some 22 established fishing sites are present between Rivière du Loup and Verte River. Commercial species fished at these sites include eel (greatest economic value), capelin, and rainbow smelt (which spawns in the Loup River some 10 km to the west); and, in the Fouquette River in the Saint-André region (some 30 km west of the study sector), tommy cod (important for recreational fishing), herring (largest fisheries in terms of volume), and American shad (Petro Canada and Alberta Gas Trunk Line Company Ltd 1979).

No spawning areas have been recorded on the north bank of Gros Cacouna Island.

Marine mammals

Areas of intense use by pods of adult and young belugas occur in the estuary opposite the site, the closest of which is about 2 km away (Gagnon 1998). Belugas frequent the Gors Cacouna sector in the spring and fall. In addition, one of the main grey seal ledges in the middle estuary is found to the east (2 km) and another 3 km to the west.

The upstream limit for minke whale is in the vicinity of Cacouna.

Birds

The Gros Cacouna site is characterized by its exceptionally rich bird fauna. It provides feeding and resting habitats for hundreds of migratory birds and nesting areas for a number of birds. Gros Cacouna marsh is recognized as an Important Bird Area (IBA) for the conservation of birds in Canada, and is considered to be globally, continentally and nationally significant. The habitats that occur at this site are salt mudflats, open water, coastal cliffs or rocky shoreline and arable and cultivated land. The territory covered by the IBA encompasses a 10 km stretch of shoreline,

that includes mudflats that are up to 1 km wide, and a 2 km wide strip of open water. The IBA covers 20 km^2. The site also includes Cacouna Rock, Gros-Cacouna Island and a small bay to the east of the island. http://www.bsc-eoc.org/iba/site.cfm?siteID=QC043&lang=fr. Since no conservation plan has yet been put in place for this specific IBA, no map of the area has been prepared (Pers. Comm. Mari-Soleil Laporte UQCN).

This bird colony site (with 100 to 999 pairs) supports common eider. Its numbers have however dropped significantly in the past decade, with only 49 pairs present in 1996. Herring gulls, great black-backed gulls and black guillemots are present, along with a staging site for brant (with 100 to 499 individuals/km of shoreline) and pond ducks in fall (Gagnon 1998).

The most abundant birds in spring are snow geese, Canada geese and American black duck. The latter also frequents the area in the fall. The largest numbers of American black duck are found in the area in late September, early October.

The most abundant waterfowl that breed in the Gros Cacouna sector are ducks, cormorants and gulls. There are also a few herons. Most of these species, even those that nest on nearby islands, rely on the food resources of the salt marshes and intertidal flats (Petro Canada and Alberta Gas Trunk Line Company Ltd. 1979).

The yellow rail has been observed during the nesting period (Gagnon 1998), and the herring gull and great black-backed gull also nest at this site (Pelletier *et al.* 1990).

The cliffs on the northwest of Gros-Cacouna Island support a small colony of black guillemot, while Cacouna Rock has herring gulls, great black-backed gulls and common eider.

The snow goose and common eider are common to the region, while brant, American black duck and teal are occasionally seen in the area. The site is considered one of the three most important shorebird sites on the south shore of the river between La Pocatière and Matane. The site supports a large number of black-crowned night herons that nest in the vicinity and use the deciduous forest southwest of Gros-Cacouna Island for night-time roosting. http://www.bsc-eoc.org/iba/site.cfm?siteID=QC043&lang=fr

Other nesting species are also present on the site, including several species with restricted numbers or ranges in Quebec, such as Nelson's sharp-tailed sparrow, Wilson's phalarope, Le Conte's sparrow and marsh wren.

Marsan (1997) reported 10 common eider nests, 20 great black-backed gull nests and 180 herring gull nests on Cacouna Rock.

Lehoux and de Repentigny (1987) consider the cove area to the east of Cacouna Island to be one of the most vulnerable waterfowl concentration sites in the St. Lawrence. They have assigned it superior, very high and high values.

Five species at risk nationally have been reported during migration or in summer: Harlequin duck red-shouldered hawk, least bittern, peregrine falcon and short-eared owl. http://www.bsc-eoc.org/iba/site.cfm?siteID=QC043&lang=fr

More rare species, such as the sharp-tailed sparrow, Wilson's phalarope, Virginia rail and sora rail, are also present.

Advantages

There are no intertidal marshes on the northwestern part of the island.

There are no fish spawning areas on the northern part of the island.

Disadvantages

Exceptionally rich bird fauna (IBA), which use the site as feeding, resting and staging areas; bird colony sites; waterfowl concentration sites that are vulnerable (high to superior).

Presence of rare or at risk bird species.

Cliffs on the northwestern part of the island shelter black guillemot.

One rare plant species reported from the northeast (1 km away)

Area used intensively by belugas (2 km away)

One of the main seal ledges in the middle estuary (2 km away)

Upstream limit for minke whale

4.4.3 Human Environment

Land use

The target site falls within the Rivière-du-Loup RCM. The development plan (updated in October 1997) specifies industrial-port land use for the island, which means that a methane tanker terminal would likely be authorized here, as well as at Ville Guay. Nonetheless, the Cacouna Bay marsh (on the eastern part of the island) is reserved for wildlife use.

Water intakes and effluent

The main local source of pollution for Gros Cacouna, as noted by Gagnon (1998), is the effluent from the municipal treatment system

Archeological resources

The presence of prehistoric archeological sites on Gors-Cacouna Island were noted in the development plan for the Rivière-du-Loup RCM (MRC de Rivière-du-Loup 1987). Any discoveries of archeological remains must be reported immediately to the relevant authorities at the QuebecMinistry of Cultural Affairs.

Socio-economic issues

Many of the bird species present in the Gros Cacouna sector are important for recreational, educational and ecological purposes. The sector to the east of Gros Cacouna is a popular hunting and birding site (Petro Canada and Alberta Gas Trunk Line Company Ltd. (1979) for Ville Guay).

Socio-economic impact of project

The existing port facilities are underused because the proposed methane tanker terminal project never came to fruition. The local population remains frustrated because the promise of economic benefits never materialized (Pelletier *et al*.1990). It is therefore clear that building the LNG terminal would be very well received by the population as an economic boost for the region.

The presence of the terminal would be felt primarily by the Rivière-du-Loup population; however, the recruitment of workers and the economic impact during construction would be regional in scope, involving the entire Kamouraska/Rivière-du-Loup/Témiscouata region.

The Kamouraska/Rivière-du-Loup/Témiscouata region has a high unemployment rate, an income level below the provincial average and a lower concentration of jobs in the secondary sector than other regions of Quebec. The major impact would be felt during port construction and it would

be only during that period (about four years) that the port would have an influence over the regional job structure. Once construction is complete, the port's influence would be limited to the Rivière-du-Loup region owing to the limited number of permanent jobs to be created.

The area is struggling economically despite its considerable potential (favourable geographical location, available human resources, existing socio-economic infrastructure) that is just waiting to be tapped. The project seems to hold great promise for the region.

Advantages
Respect for special land use on the western side of the island
The environment has undergone many anthropogenic disturbances
The population has been waiting for such a project for a long time
Disadvantages
Eastern part of the island reserved for wildlife
Recreational, educational and ecological activities