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Floods in La Paz, Bolivia

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Environmental report

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Translated from Spanish

ENVIRONMENTAL REPORT

Natural features

The city of La Paz occupies an area of some 60 sq. km, at an altitude of between 3,600 and 4,500 m above sea level. It lies on a steeply sloping declivity on the north-eastern edge of the El Alto tableland, at the foot of the eastern Cordillera of the Bolivian Andes, and is in the catchment area of the La Paz river. Given its specific geological and geomorphological features, compounded by uncontrolled urban development, the city's environmental situation is highly problematic.

Geologically speaking, the oldest rock formations are lutite and arsenic, ranging from the Palaeozoic era to the lower Tertiary period. The sedimentary formations which make up the tableland date to the Plio-Pleistocene age. Superimposed on these are contemporary deposits resulting from erosion of the La Paz river basin. In particular, the two most recent strata have created a highly unstable sloping surface, which, in general, is extremely hazardous for urban development.

The region is drained by the Choqueyapu, Chuquiaguillo, Irpavi, Achumani, Huafñajahuira, Wilakota and Achocalla rivers and by numerous small tributaries, which together make up the drainage area of the La Paz river.

The climate varies in accordance with altitude. In general terms, it can be described as a high montane tropical climate. In the centre of the La Paz city area, the climate is very dry, with a mean annual temperature of 11.3 °C and mean annual precipitation of approximately 540 mm. In the southern area of the city, climate conditions are more temperate, with a mean annual temperature of some 24 °C and mean annual precipitation of 828 mm.

Because of the intense pressure of human settlement, plant cover in the urban area is sparse and limited, comprising grass and shrubs, and small woodland areas of eucalyptus, with some tree-lined avenues and city squares. Originally, given the considerable variation in altitude, there were various distinct types of plant cover in this region.

The high Andean level, at 4,100-4,200 metres, represented by the higher valleys to the north and north-west of La Paz and, to a lesser extent, around Mount Cufiamani (4,367 metres) to

the south-east of the city, were characterized by two main physiognomical classes of vegetation: the first comprising relatively homogenous, dense grassy areas in low-lying pockets on the slopes and on the hillsides; and the second more scattered patches of legumes, herbs and other small plants, on the slopes and hills.

At the La Puna level (3,500-4,200 metres), scattered about various parts of the valley, including to the north-east and north-west (the El Alto tableland) of the city of La Paz, the plant cover which originally predominated consisted of low forest, made up of a mixture of tree and shrub species. Remnants of this low forest cover can still be seen today in narrow gorges and ravines which are relatively humid and inaccessible.

The level of the Prepuna (3,000-3,500 metres) and the Valle Seco, or "dry valley" (short, but deep and wide Andean canyons), situated to the south and south-west of La Paz, on the sides of the western Cordillera mountain range, were originally covered by open woodland with a variety of low-growing deciduous species. Isolated patches of this plant cover can still be found in the Abajo river area, growing in among succulents and thorn trees in areas also replanted with eucalyptus, fodder grasses and various other crops.

Environmental factors exacerbating the emergency

I. Sewage

- (a) There is no sewage system separate from the rainwater drainage system.
- (b) There is no system for the treatment of sewage.

II. Waste

- (a) Inadequate arrangements for the disposal of solid wastes dumped on the city streets and in the river valleys.

III. Urban settlement

- (a) Deforestation;
- (b) Depletion of the soil layer on hillsides cleared for buildings and urban infrastructure;
- (c) Extensive settlement of environmentally fragile areas, in particular, steep slopes;
- (d) Laying of pipelines, levelling of slopes and digging of river channels;
- (e) Waterproofing of the soil.

Principal environmental impacts identified as being associated with the emergency

- Ground pollution caused by sewage overflowing from rivers and spilling into the streets as a result of upflows occurring in more than 80 areas in the city;

- Erosion of agricultural soil as a result of changes to the flow of rivers, particularly in the Abajo river area;
- Destruction of crops, either ripped out or buried by sedimentary deposits caused by the flooding of lower-lying areas of the La Paz river basin;
- Reforested areas washed away and soils eroded on the banks of the La Paz river and its tributaries;
- Pollution of groundwater caused by the spilling of sewage in some aquifer recharge areas;
- Owing to possible pollution of water sources and shortage of drinking water, the Government has declared a national health emergency.

Recommendations

- (a) A permanent system should be developed for monitoring water quality in the rivers;
- (b) Plans should be drawn up and implemented for separating the sewerage and rainwater drainage systems;
- (c) Sewage treatment systems should be developed;
- (d) Risk studies should be updated;
- (e) The geological and hydrometeorological indicators should be monitored as an early warning system, in view of the potential for landslides and floods;
- (f) Plans should be drawn up to relocate settlements from high-risk areas, based on the findings of proposed studies;
- (g) Plans should be drawn up for the maintenance of a drainage network and for flood protection schemes;
- (h) Plans should be drawn up for the development of physical protection structures and structures to mitigate the effects of natural processes in the region, carefully tailored to the specific characteristics of those processes;
- (i) Reforestation plans should be drawn up and implemented for the most vulnerable areas, based on existing studies and taking due account of local plant characteristics;
- (j) An environmental education programme should be conducted to consider such issues as waste disposal, illegal pipe-laying and forestation;

(k) Management plans should be developed for homogenous geographical areas, which could be catchment areas or other areas depending on local features. In any event, when management plans are drawn up, due account should be taken of existing and potential natural and social processes and their specific features;

(l) Municipal regulations should be drawn up and passed for the purpose of managing land use and planning urban development in a more sustainable manner.
