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# Monitoring of urban growth and its related environmental impacts: Niamey case study (Niger)

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**Abstract**

The present contribution is about a preliminary study of the evolution of Niamey city (Niger) during last decades.
Recent advances in remote sensing, both in satellite hardware technology and image availability development, provide opportunities image collection and multitemporal analysis on urban form and size that can be useful for policy and planning. Some opportunities for, and limitations on, monitoring urban growth using remote sensing data are shown in the present contribution; moreover examples of environmental impacts of urban growth, as monitored with remote sensing, are provided in order to define future development of dumps and quarries and its environmental impacts on Niamey city.


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*Keywords:* Satellite Images; GIS; Quarries; Environmental impacts; Niger

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## 1. Introduction

Niamey is the capital of Niger (Fig.1) and is the first city in the country as dimension, culture and economic importance. Its population increased gradually, from about 3,000 in 1930 to about 30,000 in 1960, rising to 250,000 in 1980 and, according to the official statistics, to 800,000 in 2000. Its patterns of population, livelihoods, and its dominant role within the national economy of Niger make it a good representative case study for West Africa.

The research analyses the enlargement of Niamey City from 1979 to 2014 using satellite images. Moreover, two pilot sites have been investigated to highlight the increasing aggregate quarry activity, probably due to huge population growth.


Fig. 1. Niger is a landlocked developing country located in Western Africa into Sahel Region (ArcGlobe-ESRI).

## 2. Geological Settings

Geologically the Niamey region straddles between the Liptako, corresponding to the northern extremity of the East ridge of Man, and the south-western edge of the Iullemmeden basin. The Niamey region consists of two main geological units, including:

- The Paleoproterozoic basement (2300-2000 Ma [1]), which includes granitoid plutons alternating with greenstone belts (Fig. 2). Granitoids consist of diorite intrusions, quartz diorite to tonalite, monzonite, granodiorite and granite or syenite locally. These intrusive bodies are either syn-tectonic or post-tectonic [2,3,4,5]. The green rocks consist of sandstones-pelitic rocks more or less metamorphosed (shales, sericite schists, micaceous schists, quartzitic schists) and low to medium metamorphic greenstone (amphibolite, chlorite, metabasalts, metagabbros) [6].
- Overlying formations represented by a lower older unit essentially consisting of Upper Precambrian sediments (Niamey sandstone, grN, Fig. 2) [7, 8] and an upper unit (post Eocene) of the Continental terminal formation (facies Ct3, Fig. 2) and quaternary to recent deposits (facies a and d, Fig. 2).