RIVER LANDSCAPE OF LARGE RIVER – CASE STUDY OF THE NILE RIVER

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Abstract
River with its environment, as the source of the social development, is the one of landscapes where biophysical and socio-economic processes are very active at present. The aim of the article is to explain the notion of large river and give the general description of the River Nile basin landscape with paying particular attention to its water resources utilization and the policy of its environmental management.

Keywords: river landscape, large river, river Nile

1 Introduction
Research and studies of rivers, channel-flood plain and valley systems enjoy quite a long tradition and continuous development is its characteristic feature. Moreover, recently it progressed dramatically thanks to new tools, method, procedures, improved analytical tools and the data technology providing new and more accurate quantitative data concerning the structure, processes and forms in river landscapes and their interactions with environment. The current research, above all, brought new and more accurate methodology and sophisticated fieldwork procedures that yield more precise input data. This trend was determined by an increasing interest in improvement of the condition of streams and other water bodies suffering from the global deterioration of their quality as a result of increasing anthropogenic impact and the global environmental and/or climate change. Rivers worldwide, as the most complicated, most dynamic but also most vulnerable landscape elements, have been altered and destabilized. This is manifested in changed parameters of their longitudinal and transversal profiles, runoff-sedimentation regimes and modification of land cover structures of the riverine landscapes. Thus, in developing countries, this situation, new legislation and practical needs have called for greater attention to rivers and their environs. The aim of the article is to explain the notion of river landscape, large river and give the general description of the River Nile basin landscape with paying particular attention to its water resources utilization and the policy of its environmental management.

River landscape
Rivers are considered important either for the people or for all types of life everywhere. It is not the principal place of people for gaming and entertainment, but people used to provide drinking water, irrigation, electricity generation, and disposal of waste (waste treatment), and transfer mechanisms, and access to food. The rivers also very important for all types of animals and plants. It also helps to keep the river water aquifers filled with groundwater through leakage of water into the ground through the dust settles on the bottom. Remains, of course, ocean filled with water, because the rivers draining into them permanently. On the banks of the river grew up the oldest of human civilizations and most powerful man. Riverine landscape as the phrase creates an instant contradiction of terms how can river be landscape? Should not be referring to river scape or streamscape or aquascapes, something that more explicitly recognizes that we are dealing with an aquatic system? After all landscape traditionally refers to an area of land, an expense of natural scenery that can be seen from a single viewpoint (Random House 1999). River system is characterized as an interrelating
system of flow, sediment transport, channel and bed morphology, and vegetation. The comprehensive “product of water stream” is first of all formed by the specific geomorphologic-substrate base (the channel-floodplain geosystem, Lehotský, 2002). Thus riverine landscape is understood

Fig. 1. Three perception of riverine landscape. A - as homogeneous element contained within a broader terrestrial landscape, B - as geosystem connected with the surrounding landscape, C - as heterogeneous geosystem (source Lehotský, 2002 based on Wiens, 2002). to consist of channel zone and adjacent riparian zone, extended to the limit of influence of contemporary fluvial processes. This includes the entire floodplain of the river. After Lehotský (2006) riverine landscape is understood as complex corridor entity in the valley floor which consists of physico-geomorphic basis (channel-floodplain geosystem), facial-soil and habitat structures with biotic societies, and land use/land cover structure. Its perception could be different (cf. Wiens, 2002). Most often, landscape ecologists have dealt with rivers as simply one element of a landscape mosaic, equivalent to fields, forests, roadways or urban centers.

2 Riverine landscape of large rivers of the world

What does a large river mean?

Large rivers are important component of continental landforms. They are important constituents of world hydrology cycle; they not only possess inorganic constituents but also support biotic systems. Numbers of them have been associated with the growth and development of human civilization in their fertile valleys. Several have been impounded, starting from the second quarter of twentieth century. In spite of these rivers being physical marvel and resources utilized by large number of people, our knowledge about their form evolution of function remains limited. This is possible due to logistical problems, as case studies in the fields of geomorphology, sedimentology or river ecology are generally on smaller rivers that are easier to investigate, model or manage. Our knowledge of these rivers also varies. A lot more is known about the Mississippi or the Colorado than the Zambezi. The Nile has been measured for thousands of years but not the Congo. The Amazon is attracting a very large number of researchers from a wide range of institutions, countries and specializations but such large-scale national or international endeavours are rare for other tropical rivers.
Large rivers are hydrological system with high magnitude basin areas, main canal length, and water and sediment discharges. But proper definition is elusive. Potter (1978) in the paper on the significant and origin of big rivers, listed four properties that could be considered for this purpose: size of the drainages basin, length of the river, volume of sediment transported and water discharge. He used river length and drainage basin size to identify the 50 largest river of the world. All except one of these rivers were more than $10^3$ km long and smallest drainage basin was $10^3$ km². These 50 streams collectively drain about 47% of the continental surface (Potter, 1978). In terms of length, several rivers fall within the 2000-3000 km but larger cluster is within the length 4000-5000 km range. Only two rivers are longer than 6000 km Nile and Amazon. Rivers of this size are logistically difficult to study in the field. This problem is partially solved by using satellite images that currently remain archived in many centres across the world. Application of this resource allows mapping over long reaches, recognition of large-scale features in the channel and repeated observation over time (Gupta, 1999).

Settings of large rivers
Based on the basin forming mechanism according to the principle of plate tectonics three major setting of large rivers can be identified (Gupta, 1999):
- Continental collision belts
- Rift system
- Cratonic setting

After the complexity of drainage basin type of large rivers system large rivers can be classified as follows (Gupta, 1999):
- Longitudinal trunk system
- Transverse drainage
- Mountain fed system
- Foot hills-fed system
- Confined in the mountain belt
- Cratonic setting
- Domal flank drainage
- Mountain front

After the climatic conditions which world large river are flowing through they can be classified as follows:
- Large rivers of the equatorial regions: Amazon River, Congo River and Zambezi River
- Large rivers of the dry land: Indus River, Colorado River and Murray-Darling River
- Large Rivers of the mid latitudes: Mississippi River, Danube River, Changjiang River, Mekong River, Ob Yenisey and Lena Rivers and Mackenzie and Yukon Rivers

Response of river landscape to human disturbance
Human modifications to biophysical attributes of river landscape can be direct or indirect. Direct modifications to the channel bed and/or banks have typically taken the form of resource development activities (dams, channelization, water supply, power generation, gravel extraction programs, clearance of riparian vegetation) or structural engineering works designed the alleviate the effects of flooding. Clearance of riparian vegetation cover removal of woody debris have generally accompanied these activities. Indirect human impacts (forest clearance in river basins, desertification, urbanization, and mining) refer to adjustments brought about as secondary responses to changes outside the channel that modify the discharge and/or sediment load of the river. Summarize, the main human interventions in the hydrological cycle in relation to river, lake and estuary regulation could be subdivided into
the following topics: a) damming, building and management of reservoirs, b) river channelization, c) building of weirs, d) dredging of river channels, d) lake regulation, e) estuary regulation.

3 The river Nile

The Nile is the greatest river of northeast Africa. It begins in well-watered regions near the equator and flows northward across the Sahara Desert before it empties into the eastern Mediterranean Sea. Both the source of the White Nile in Equatorial Africa and its mouth on the southern shore of the Mediterranean Sea lie within one degree of longitude. It crosses 35 degrees of latitude. In spite of its great length and large drainage basin about 10% of Africa, and affecting 9 countries, it carries relatively little water, because no water is added to it north of its confluence with the Atbara River, and much is lost by evaporation. The Nile consists of two principal branches - the White Nile and the Blue Nile - which join at Khartoum to form the main Nile. The White Nile, which is the longest segment, may be further subdivided into: 1) The Central Sudan region; 2) The Sudd; and 3) the Lake Plateau region. The river basin is characterized by variety of landscape – with high mountains, tropical forests, woodlands, lakes, savanna, wetland, arid lands and deserts culminating in an enormous delta on the Mediterranean Sea.

The shape of the Nile we know today is a very recent development. The present day river is complex and is the result of the interconnection of several independent basins by rivers which developed during the last wet period which affected Africa after the retreat of the ice of the last glacial age, some 10,000 years ago. The basin of the present-day Nile can be divided into six major regions: the Lake Plateau, the Sudd, the White Nile, the Ethiopian Plateau, the Main Nile and the Nile Delta. The principal feature of the Nile River's hydrological regime below the Aswan High Dam is the annual flood. In the northern Sudan, the river usually begins to rise in May, reaches its maximum level in August, and decreases thereafter, having a low level from January to May. Although the flood is a regular phenomenon, it varies in both its volume and in its date of onset.

The population of the River Nile basin is now estimated at over 250 10⁶ people, which represents almost 40% of Africa’s population (equivalent to approximately 300 million people) is increasing at an annual rate of about 3%. Due to the limited availability of renewable sources of water, population growth will decrease the available per capita water. Population distribution in the basin is dominated by a shift toward greater urbanization. For instance, the urban population in Burundi, Ethiopia, Rwanda, and Uganda is projected to more than double as a percentage of the total population. This redistribution presents implications for water management as urban populations generally consume more water per capita for domestic and industrial use than rural populations. Agricultural production consumes the largest amount of water per unit of GDP, followed by the midrange industrial sector and the least consumptive services sector.(El-Fadel,El-sayegh,El-Fadl and Khorbotly, 2003).

Tropical rain forest is found along the Nile-, in parts of the Lake Plateau, and in southwestern Ethiopia. On the Sudanese plains, a mixture of thin bush, thorny trees, and open grassland prevails. This area is swampy during the rainy season, particularly in the Sudd region of the south-central Sudan. The vegetation there includes papyrus, tall bamboo-like grasses From Khartoum northward there is true desert. The River Nile is rich of a lot of fauna as well as flora species like different fish, reptiles, mammals.
4 Regulatory environment, institutional issues and land use planning - Nile basin initiative

Since 1999, the Nile Basin Initiative (NBI) has provided the institutional basis for cooperation between the Nile Basin states based on a shared vision: “To achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin resources”. With strong international backing and success in attracting funding, the NBI has progressed rapidly in the last six years and is now at the stage of project preparation and implementation. Many of these projects represent an unprecedented opportunity to develop the waters of the river and the environment within the basin to optimize the benefits available to all countries. This can significantly advance socio-economic development within all basin countries whilst helping to reduce conflict and insecurity. The NBI’s policy guidelines set out the primary objectives:

- Target poverty eradication and promote economic integration;
- Develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples.
- Ensure efficient water management and the optimal use of the resources.
- Ensure cooperation and joint action between the riparian countries, seeking win-win gains (NBI, 2001).

5 Conclusion

As the River Nile demonstrates remarkably different characters, behaviours and evolutionary traits, it needs to be managed in a flexible manner, recognizing what forms and processes occur where, why and how often, and how these processes have changed over time. Recently, recognition of the adverse effects of human impacts on its landscape systems, coupled with a rise in environmental awareness, has driven initiatives for its management scheme.

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6 Literature


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