Ecological Landscape Assessment of Banpo Stream in Seoul, South Korea

Jessica Tavares Machado*, Gunwoo Kim**
*Master Course, Landscape Urbanism Major, Graduate School of Urban Studies, Hanyang University
**Assistant Professor, Landscape Urbanism Major, Graduate School of Urban Studies, Hanyang University

1. Introduction

Urban stream restoration has increased due to enhanced awareness of ornamental, recreational and public engagement benefits and increased availability of financial resources (Purcell et al., 2002). However, it is not possible to verify the projects outcomes without properly conducting monitoring and assessment (Kondolf, 1995). Particularly in relation to small urban stream projects, the insufficient monitoring due to lack of investment make it difficult to identify the impacts of the restoration project and, consequently, to develop improvement plans. Therefore, to advance the science and practice of ecological restoration, long-term monitoring and the study of the successes and failures of stream restoration projects are required (Klein et al., 2007).

The Banpo stream, in Seoul, South Korea, is an urban stream that had its natural form until the early 1960s, but it was covered due to the urbanization and construction of a complex of apartments (Seoul Historical Compilation Committee, 2000). In 2010, an ecological restoration project was conducted to restore 2.77km of the stream. The restoration aimed to solve the bad smell problem due to the polluted water and provide a good environment for the residents (Son, 2010). Since then, a few monitoring reports were released (Seoul Central 50 Plus Center, 2021) but no assessment study has been documented yet.

Cities are dealing with challenges resulting from climate change impacts. In South Korea, extreme precipitation phenomena are predicted to occur more frequently according to the Korean Climate Change Assessment Report (Ministry of Environment, 2020). Faced with this, the role of nature-based solutions is being highlighted, and measures that integrate ecological and social functions should be applied in new projects, but also in the adaptive management of prior restorations. Accordingly, comprehending the benefits and weaknesses of previous projects is primordial to present a critical basis for the future development of integrated plans and landscape designs that achieve multiple strategic objectives (Stewart and Neily, 2008). Palmer et al. (2005) argue that to define one project as successful three categories must be evaluated: the ecological success; the learning success, where new lessons are learned and promulgated; and the stakeholder success that includes the aesthetics, costs and meeting perceived goals.

Thus, this study aims to comprehensively assess the social and ecological landscape outcomes of the Banpo stream restoration project to provide a reliable basis for adaptative management and future improvement plans.

2. Methods

This study will be conducted through a literature review, followed by interviews of professionals, a survey with users of the stream area, and finally, an analysis of the ecological landscape quality. The first part of the research will consist of a theoretical background covering theories and approaches on ecological landscape assessment and stream restoration practices. Data will be analyzed through a narrative review of previous studies to obtain a broad perspective on the topics.

The second part will be based on interviews with professionals linked to the Banpo stream restoration, to understand the goals, strategies, and their thoughts on the outcomes of the project, serving as a basis for defining the indicators for assessment. The third part will consist of a survey with users of the area to understand the human use profile, their satisfaction, and perception of the restoration and the demands for improvement. Next, an analysis of the ecological landscape quality with indicators defined based on the interviews will be conducted to identify the effectiveness of the approaches used. Based on the result of the interviews, the analysis might require different sample sizes, such as *in-situ* analysis or analysis of land cover patches through GIS.

Lastly, all the data will be combined and analyzed to develop a reliable basis for the points to be improved aiming for climate change adaptation and sustainable use.

3. Expected Results and Discussion

Analysis of interviews will help find the appropriate indicators to assess the outcomes of the restoration project, and document the strategies

used. The quantitative and qualitative analysis of the surveys might indicate the need for improvements in the recreational and ecological aspects, which would confirm the hypothesis of deficient restoration strategies and management, as observed during previous visits on site and news articles reporting the problems and pollution of the stream. As the Banpo stream ecosystem was severely damaged due to urbanization, the approach of ecological landscape is expected to be appropriate as its design helps improve areas that cannot be restored to the original form. Rather, it allows applying the knowledge of nature to create high-performing landscapes that combine design goals and natural processes (Beck & Franklin, 2013). Different approaches and indicators might complement the basis for future improvement and management plans. Finally, it's expected to provide reliable guidance from the perspective of ecological landscape to improve ecological quality aiming for climate change adaptation, and to prove that the adaptive management approach helps increase the rates of learning and reduces the uncertainty about the natural systems (Levine, 2014).

4. Conclusion

As stream restoration is increasing in South Korea and worldwide, simultaneously with the negative impacts of climate change that are becoming more frequent, the need for effective and multi-beneficial approaches are also increasing. Previous strategies are proven to need replacement or improvement due to the constantly changing dynamic between the urban environment, nature, and human activities. Therefore, adaptive management is necessary to improve the outcomes of stream restorations, and the long-term monitoring of ecological changes can provide a reliable database to develop new projects and policies. The literature review shows how society and professionals expect various benefits from nature but are lacking in finding proper ways to manage natural resources in a sustainable way. The interview with professionals will suggest how climate change is affecting new approaches and policies. The survey will clarify how the users perceive and interact with the stream daily, how important it is, and what they expect from future interventions. The ecological landscape quality assessment will verify the efficiency or deficiency of the strategies applied previously and therefore provide important guidance to the development of future restoration projects.

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