Stakeholder Analysis on Floodplain Catchments Using Integrated Sustainable Parameters

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Floodplain catchments are critical ecosystems crucial for water management, biodiversity, and sustainable development. Despite numerous technical and environmental aspects incorporated into floodplain management, stakeholder complexities pose challenges to achieving integrated and sustainable practices. This study conducts a stakeholder analysis using integrated sustainable parameters to address this gap. The proposed framework involves defining catchment boundaries, conducting sustainability scanning, and performing stakeholder analysis. A case study in the UK's Nene River validates the methodology, revealing significant stakeholders often overlooked. The findings underscore the necessity for comprehensive stakeholder engagement to enhance the effectiveness, equity, and sustainability of floodplain management efforts.
Keywords: Floodplain management; Integrated assessment; Stakeholder analysis; Sustainability aspects

Introduction

Floodplain catchments are serving as critical ecosystems, playing a crucial role in water management, biodiversity conservation, and sustainable development [1]. Today Floodplain management holds significant importance especially in mitigating flood risks, protecting human settlements, preserving ecosystem services, supporting sustaining agriculture, maintaining water quality, and supporting biodiversity [2]. Although many techno-economic and environmental aspects and parameters have been included in floodplain management, the complex interplay of various stakeholders within these catchments often presents challenges in achieving integrated and sustainable management practices [3]. To address this gap, the present paper aims to conduct a stakeholder analysis on floodplain catchments, employing integrated sustainable parameters as a framework for evaluation. By integrating sustainability criteria, encompassing ecological, social, economic, and institutional dimensions, this analysis seeks to provide a holistic understanding of stakeholder dynamics within floodplain environments.

Methodology

The proposed framework, as illustrated in Figure 1, comprises of three main steps: (1) defining the catchment boundary, (2) conducting sustainability location-based scanning, and (3) performing stakeholder analysis. The objective of the first step is to establish the necessary and comprehensive geographical boundaries of the river catchment, ensuring the inclusion of all relevant parameters. To achieve this, the conventional river catchment area obtained from hydrological-hydraulic analysis will be refined or expanded based on three analyses: (a) demographic analysis using social geographic information system (GIS) layers, including factors such as population density, vulnerability, employment conditions, and minority demographics; (b) geographic analysis incorporating geological GIS layers, such as soil and rock morphology, slope conditions, and land use and land cover; (c) infrastructure analysis considering existing facilities such as roads, public transportation networks, and emergency response applications (e.g., hospitals, fire stations, police stations). Subsequently, this refined area will undergo a thorough scan to identify pinpoint locations, hazard areas, and sensitive/critical points. These points will be assessed based on three sustainability aspects: social, environmental, and economic considerations. Following this assessment, the identified points will be further analysed to determine relevant direct or indirect stakeholders. These stakeholders will then be mapped based on their mutual impacts, considering both the effects of flooding on them and their influence on current/future floodplain management planning. Finally, stakeholders will undergo evaluation using a power-interest matrix inspired by [9] to classify and prioritise them accordingly. The proposed framework is validated by the real case study located in the UK Nene River located in in Bedfordshire and is part of the 46 km2 Nene Middle catchment area. As shown in Figure 2, this part has 25 km long and has been heavily modified by industry in the past. The river Nene is a river that flows through the east of England and is the tenth-

longest in the United Kingdom. This river has lots of history of flooding [4] and many neighbourhoods marked as high and medium flood risks (See risk zone 2 and 3 in Figure 2, respectively). The required information and data are collected from free and accessible environment agency [5].
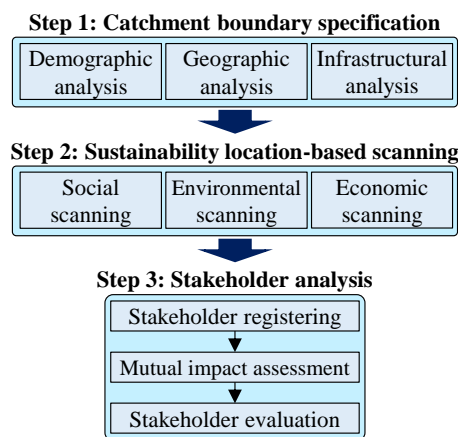
Step 1: Catchment boundary specification

Demographic analysis	Geographic analysis	Infrastructural analysis

Step 2: Sustainability location-based scanning

Social scanning	Environmental scanning	Economic scanning

Step 3: Stakeholder analysis

Stakeholder registering

Mutual impact assessment

Stakeholder evaluation

Figure 1. Proposed framework for stakeholder analysis on floodplain catchments using integrated sustainable parameters
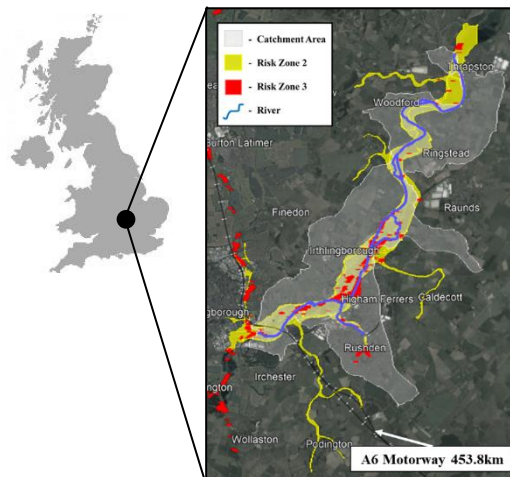

Figure 2. Geographical location of pilot study of Nene river

Result and Discussion

The main identified stakeholders and their mutual impacts are summarised in Table 2, resulting from the figures outlined in Figure 3. This analysis facilitated the creation of a power-interest matrix, demonstrated in Figure 4, highlighting the Environment Agency and residents as the primary responsible and impacted stakeholders within the floodplain area. However, upon comparison with documented flood strategic planning, it became evident that several stakeholders with considerable power and significant interest engagement, such as county councils, business associations, and internal drainage boards, were overlooked. Conversely, it was noted that some non-aligned stakeholders, such as farm estates, farmers, and fisheries, were also marginalised from the planning process. This observation underscores the need for a more comprehensive stakeholder engagement strategy to ensure the inclusion of all relevant parties with significant influence and interests in floodplain management decision-making. By addressing these oversights and involving a broader range of stakeholders, floodplain management efforts can be more effective, equitable, and sustainable in addressing the multifaceted challenges posed by flooding.

Table 1. Main identified stakeholder and their mutual impacts on floodplain management

Stakeholders	Impact on the area	Be impacted by the area
Environment Agency	Resource mobilisation	Public losing faith
Town Councils	Resource mobilisation	Public losing faith
Natural England	Legal advisory	-
Internal Drainage Boards	Legal advisory	-
Water companies	Resource mobilisation	Damage facilities
Businesses	Resource mobilisation	Access and interrupting
Lake Fisheries	Local defence system installation	Product loss
National Trust	Vegetation	Biodiversity reduction
Farms	Local defence system installation	Crop and product loss
Residents	Properties damage and injuries	Damage of infrastructure, residents or houses
Road users	-	Delays

Conclusion

Overall, the validated methodology, as demonstrated through a real case study, highlights the significance of integrated floodplain management and the inclusion of sustainability considerations in identifying and prioritising overlooked stakeholders who may influence future floodplain management plans, whether in support or opposition.
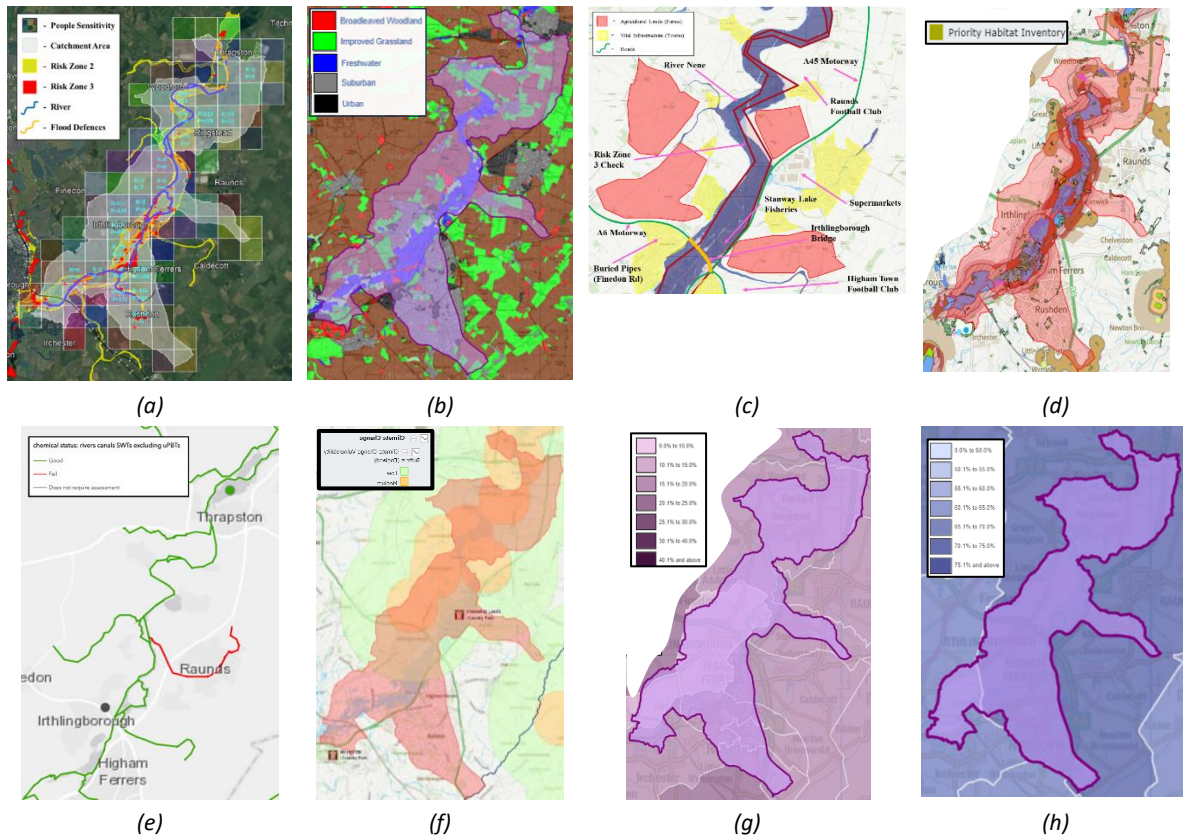
Figure 3. Important identified parameters affecting stakeholder registering: (a) people sensitive, (b) land use/cover, (c) infrastructure and facilities, (d) identified habitats, (e) Chemical pollution of surface water, (f) climate vulnerability, (g) population over 65 density, and (h) Employment density
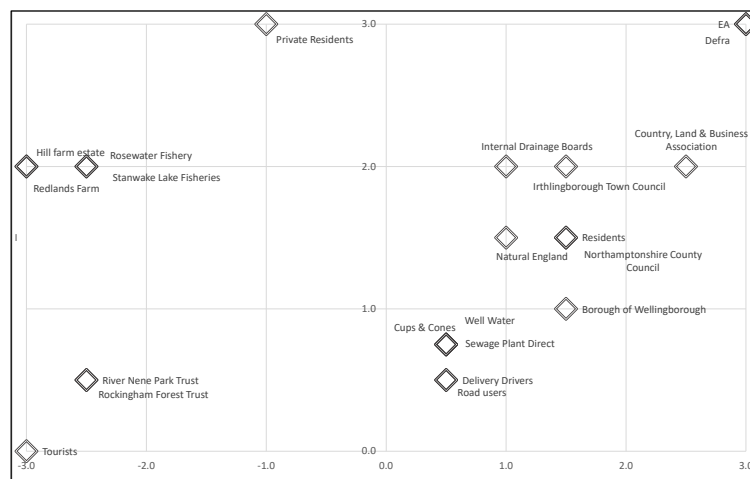

Figure 4. Analysis and results of Power-interest matrix for the case study

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