

Technical guidelines for Green Infrastructure Modelling developed

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1. Introduction

The Green Infrastructure Guidelines have been developed by ITACA – Local Development Association on behalf of ADSU Teramo with the aim of providing a comprehensive framework for designing, implementing and managing green infrastructure for flood prevention. These guidelines emphasize the promotion of nature-based solutions that leverage the inherent qualities of natural ecosystems to mitigate flood risks and their impacts. The guidelines cover various key aspects, including the context and challenges associated with floods, the advantages and principles underlying green infrastructure, the planning and design phases, as well as the management and maintenance of such infrastructure.

2. Technical guidelines for Green Infrastructure Modelling

2.1. Risk Assessment and Principles for Flood Prevention

The Green Infrastructure Guidelines present a comprehensive framework for evaluating flood vulnerabilities while championing nature-centric remedies for flood prevention. The guidelines underscore the critical task of identifying flood-prone zones and conducting meticulous analyses of hydrological and hydraulic characteristics. This deeper understanding of watercourse behavior during flood events forms the bedrock for a robust early warning system and emergency response strategy.

The nature-based paradigm emerges as a potent arsenal for flood prevention. This encompasses strategies to curtail surface runoff, enhance soil water infiltration, and safeguard and rehabilitate natural ecosystems. In the realm of design and execution, the guidelines advocate for the integration of natural drainage systems, the rejuvenation of wetlands and floodplains, and the creation of green roofs and walls. Moreover, the guidelines pivot to stress the pivotal role of stakeholder engagement and collaborative efforts in the orchestration of green infrastructure initiatives.

Central to the principles of green infrastructure for flood prevention lies the nature-based approach, which channels the potency of natural processes and systems to temper flood risks and consequences. This approach duly appreciates the value of preserving and rehabilitating natural ecosystems, a transformative endeavor that abates surface runoff and elevates water infiltration into the soil. A key directive of the guidelines also underscores the necessity of curbing impermeable surfaces in urban landscapes to thwart escalated surface runoff and resultant flooding. In this context, the guidelines champion the deployment of sustainable drainage systems, including innovative interventions like green roofs and walls, to decisively curtail surface runoff and elevate soil water infiltration.

2.2. Design, Monitoring, and Maintenance of Green Infrastructures

The Green Infrastructure Guidelines offer precise and comprehensive directives for designing, overseeing, and upkeeping green infrastructure solutions geared towards flood prevention. The core tenets of these guidelines underscore the significance of thoughtfully selecting appropriate plant species and fostering biodiversity to ensure the enduring efficacy of these eco-friendly measures.

These guidelines strongly advocate for the integration of natural drainage systems, such as swales and rain gardens, as effective tools to curtail surface runoff and bolster water infiltration into the soil. Additionally, they promote the revitalization of wetlands and floodplains, presenting a dual benefit of flood risk mitigation and the restoration of valuable habitats, coupled with enhancements to water quality.

In line with these principles, the guidelines further champion the implementation of green roofs and walls, which serve a dual purpose of minimizing surface runoff while concurrently yielding supplementary advantages such as energy conservation and the enhancement of air quality.

A key focal point of the guidelines is the systematic evaluation and assessment of the efficiency of green infrastructure measures. This encompassing endeavor encompasses continuous monitoring of their performance, including quantifying water infiltration rates into the soil, and appraising the overall influence of these measures on mitigating flood risks and consequences. In support of this, the guidelines propose leveraging modeling tools for the simulation of diverse scenarios to gauge the potential outcomes of green infrastructure implementations.

Moreover, the guidelines provide meticulous guidance on the consistent maintenance of green infrastructure features. This entails routine inspections to promptly detect and address any upkeep necessities, like pruning or replanting, while ensuring the seamless functionality of the implemented green infrastructure components. Furthermore, the guidelines underscore the utility of adaptive management strategies, advocating for responsive modifications to these green infrastructure elements, informed by the ongoing monitoring and assessment outcomes.

2.3. Synergy for Sustainable Flood Prevention

The Green Infrastructures Guidelines offer a multifaceted roadmap for seamlessly intertwining green infrastructure measures with a comprehensive flood prevention approach, educational initiatives, heightened awareness campaigns, and a robust legislative framework. This integrated approach underscores the pivotal role of collaboration in bolstering the implementation and management of green infrastructure measures.

Within these guidelines, a paramount emphasis is placed on the strategic integration of green infrastructure with other flood prevention measures. This encompasses the orchestration of early warning systems, deft emergency management strategies, incorporation into traditional drainage infrastructure, and meticulous land planning aimed at safeguarding vulnerable regions. This holistic integration not only establishes a robust flood prevention strategy but also harnesses a diversified toolkit to curtail flood risks and ensuing consequences.

The guidelines further champion the deployment of informational programs, active participation of educational institutions, and the amplification of awareness campaigns. These concerted efforts are geared towards instilling a culture of sustainable water management and elevating consciousness about flood prevention. Such campaigns serve as a conduit to augment public understanding of the manifold benefits intrinsic to green infrastructure measures while concurrently stimulating community involvement in their conceptualization, design, and administration.

Integral to the guidelines is a discerning scrutiny of the regulatory framework underpinning the implementation and governance of green infrastructure measures. This entails a meticulous analysis of potential legal or regulatory obstacles that might impede the realization of these initiatives. Collaborative engagements with governmental bodies and stakeholders form a cornerstone in surmounting such barriers. Furthermore, the guidelines advocate for the strategic deployment of incentives, ranging from tax credits to grants, as a potent means to galvanize the widespread adoption of green infrastructure measures.

3. Conclusion

The Green Infrastructure Guidelines provide a comprehensive roadmap for the design, implementation, and management of green infrastructure measures aimed at flood prevention. These guidelines emphasize the importance of integrating nature-based solutions into flood risk management strategies, promoting community engagement, and addressing regulatory frameworks. This summary presents key points from the guidelines and outlines recommendations for future efforts in promoting green infrastructure for flood prevention.

Crucial Aspects Addressed

Flood Risk Assessment

The guidelines underscore the significance of identifying flood-prone areas and conducting meticulous hydrological and hydraulic analyses. This understanding of watercourse behavior during floods forms the foundation for effective flood prevention strategies.

Principles of Green Infrastructure

Green infrastructure, rooted in the nature-based approach, is highlighted as a potent tool for flood prevention. Techniques such as reducing surface runoff, enhancing soil water infiltration, and conserving natural ecosystems contribute to a holistic flood mitigation strategy.

Thoughtful Design Criteria

The guidelines stress the importance of careful planning in green infrastructure design. Choosing suitable vegetation, encouraging biodiversity, and incorporating sustainable drainage, water retention, and detention techniques enhance the functionality and resilience of green infrastructure.

Monitoring and Maintenance

Continuous performance monitoring and proactive maintenance are crucial for sustaining green infrastructure effectiveness over time. Active community involvement in management and maintenance further contributes to their long-term success.

Integration with other measures

A holistic approach is advocated by integrating green infrastructure with existing flood prevention measures like early warning systems, emergency management, conventional drainage infrastructure, and strategic land planning for vulnerable areas.

Education and awareness

Raising public consciousness through informative programs, school engagement, and awareness campaigns fosters a culture of sustainable water management and promotes community participation in flood prevention.

Regulatory Considerations

Recognizing the need for a supportive regulatory framework, the guidelines highlight the importance of identifying and addressing legal and regulatory barriers to green infrastructure implementation. The guidelines suggest leveraging incentives like tax credits and grants to promote adoption.

Future Perspectives and Recommendations

Increased Awareness and Community Involvement

Collaboration among local authorities, governmental bodies, NGOs, and industry experts is essential to amplify awareness about green infrastructure's benefits. Community engagement in planning, design, and management enhances its effectiveness.

Holistic Approach and Integration

Green infrastructure should be viewed as an integral component of a comprehensive flood risk management strategy. Integrating it with stormwater management, land planning, and preservation of natural areas strengthens flood prevention efforts.

Continued Innovation and Research

Investing in research and innovation fosters advancements in green infrastructure technology, materials, and design. These advancements enhance the efficiency and effectiveness of flood prevention measures.

Collaboration and Partnership

Collaboration between the public and private sectors facilitates knowledge exchange, resource sharing, and large-scale implementation of green infrastructure projects.

Professional Development and Capacity Building

Providing training opportunities for professionals and operators ensures proper design, implementation, and management of green infrastructure. Workshops, courses, and knowledge exchanges contribute to expertise enhancement.

Structured Monitoring and Evaluation

Establishing systematic monitoring and evaluation programs helps assess the impact and effectiveness of green infrastructure. This process identifies areas for improvement and ensures sustained functionality.

Promoting Knowledge Exchange and Best Practices

Facilitating dialogue among stakeholders fosters the identification and dissemination of best practices. Conferences, workshops, publications, and digital platforms facilitate the exchange of valuable insights.

As green infrastructure gains recognition as a potent flood prevention tool, its successful implementation hinges on collaboration, innovation, and community involvement. By adhering to these guidelines and embracing future recommendations, stakeholders can work together to create resilient and sustainable flood prevention strategies that integrate green infrastructure seamlessly.

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5. Annexes

- Technical guidelines for Green Infrastructure Modelling