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POST-PLANTING MORTALITY IN ARID NATIONAL TREE PROGRAMS: A COMPARATIVE ANALYSIS WITH A PROPOSED DIGITAL INTERVENTION MODEL

Toshmatova Guzal
Environmental Hygiene, Tashkent State
Medical University, Tashkent, Uzbekistan
E-mail: g.toshmatova@yahoo.com
Phone: +998909076379

Yo'ldoshova Dilnoza
Student of Group 202, Faculty of General Medicine No. 2,
Tashkent State Medical University, Tashkent, Uzbekistan
E-mail: dilnozayoldosheva27@gmail.com
Phone: +998946939666

Islomjon Izbasarov
Student of Group 202, Faculty of General Medicine No. 2,
Tashkent State Medical University, Tashkent, Uzbekistan
E-mail: izbosarovislomjon@gmail.com
Phone: +998900160699

Gullola Tohirova
Student of the Faculty of General Medicine,
Tashkent State Medical University, Tashkent, Uzbekistan
E-mail: gullolatoxirovaferpc@gmail.com

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Nurillayeva Pokizaxon
Student of Group 202, Faculty of General Medicine No. 2,
Tashkent State Medical University, Tashkent, Uzbekistan
E-mail: nurullayevapokiza6@gmail.com

Abstract

Trees are essential for human and environmental health as they provide oxygen, store carbon dioxide, and filter atmospheric air. In Uzbekistan, every year millions of dollars are invested by large-scale national afforestation programs for planting trees in arid and semi-arid regions. Even though planting targets are met, survival targets are not. Yashil Makon, the government's initiative, targets one billion tree plantings by 2026, yet Daryo.uz (2022) documents the death of 2.4 million saplings in a single spring season mainly due to irrigation failure and the absence of post-planting accountability mechanisms. This article examines this issue in Uzbekistan and comparable arid regions and proposes a digital intervention model to address it.

Keywords: Urban forestry; sapling survival; mobile application; citizen science; gamification; arid climate; behavioral intervention; tree mortality.

Introduction

The global significance of expanding urban tree planting has created unprecedented institutional momentum. Bastin et al. (2019) report that dozens of countries have adopted urban greening targets, exceeding 1.0 trillion trees globally since 2015. Yet a persistent gap between planting targets and survival outcomes has been documented in the scientific literature. This divergence is most acute in arid and semi-arid climates, where first-year sapling mortality can exceed 50%.

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The causes are the following: water deficiency while establishing, absence of care accountability, inadequate species-site matching, and the organizational logic of mass planting events, because it generates visible short-term action but lacks the sustained, individualized effort that sapling survival requires. Uzbekistan particularly shows an acute illustration of such occasions,where landscapes of dead saplings represent ecological loss and wasted institutional investment. Classified as a BWk/BSk climate under the Köppen-Geiger system, the country receives 100–200 mm of annual precipitation, with summer temperatures regularly exceeding 40°C.

Aim and Relevance of Study

This paper proposes the Tree Stewardship and Incentive Platform, a mobile application framework that complements existing planting programs by: (1) assigning individual care responsibility through geo-referenced tree registration; (2) delivering algorithmically generated, species-specific irrigation prescriptions; (3) verifying care activity through photo-based logging; and (4) sustaining engagement through a tiered gamified reward system adapted to **Uzbekistan's** socio-institutional context. **A** field trial or deployment has not been conducted. The work is mainly relevant to Uzbekistan's Yashil Makon program — where documented accountability failures create an urgent design problem — and to analogous problems across Central Asia and other arid regions.

Materials and Methods

The TSIP framework was designed using three complementary approaches. First, a systematic review of more than 50 peer-reviewed studies examining urban tree mortality in arid climates was conducted to understand the scale of the problem. The review showed that post-planting mortality rates vary widely, ranging from 0.6% to 68.5%.

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Second, a documentary analysis of materials related to the Yashil Makon program (2022–2024) was carried out. This included parliamentary reports, feasibility assessments prepared by UNDP, and regional inspection records. The analysis helped identify the specific accountability gap that affects tree-planting initiatives in Uzbekistan.

Third, insights from behavioral theory literature—particularly research on gamification, citizen science, and compliance in mobile health applications—were used to shape the incentive mechanisms within the framework.

No primary field data were collected for this study. Instead, the paper presents a conceptual model, while empirical testing and evaluation of the framework are suggested as directions for future research.

Results

The system is structured around four interconnected components: geo-referenced tree registration, an irrigation recommendation algorithm adjusted for evapotranspiration using temperature- and humidity-based approximations derived from Uzhydromet meteorological data, a multi-criteria tree-care verification system, and a tiered framework for incentives and recognition.

The irrigation module is intended to generate watering recommendations using five key inputs. These include the species and age of the tree, daily temperature and humidity data obtained from Uzhydromet, soil substrate type across five major lowland soil categories in Uzbekistan, the time elapsed since the last confirmed watering event, and the phenological growth stage of the tree. The latter adjusts water demand coefficients by approximately ±30–50%. Watering notifications are scheduled to minimise evaporative water loss. Additionally, emergency alerts are triggered when the atmospheric temperature reaches 38°C or higher.

The verification component is designed to evaluate user-submitted photographs through automated checks: confirmation that the GPS location is within 20 meters

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of the registered tree, validation that the timestamp falls within ±2 hours of the recommended watering window, and convolutional neural network (CNN)-based image classification to detect evidence of watering. During the design stage, the model is to be trained on a dataset of approximately 12,000 labeled images to detect visual indicators of watering such as soil moisture darkening, visible water flow, or watering containers.

The platform's incentive system (summarized in Table 1) is structured around three behavioral phases—adoption, habit formation, and long-term commitment.

Table 1.

Behavioral Trigger	Points	Recognition Unlock
Tree registration + photo baseline	50 pts	Steward profile badge
First verified watering event	30 pts	"First Care" achievement
7-consecutive-day watering compliance	100 pts	"Community Steward" status
30-day compliance ≥80% of prescriptions	500 pts	Mahalla leaderboard listing
Tree survival at 6-month inspection	1,000 pts	"Ecosystem Contributor" certificate
Tree survival at 12-month inspection	2,000 pts	Regional recognition award; nursery discount
Community referral (new user registration)	200 pts	Network multiplier activation

Since TSIP has not yet been implemented, there are currently no deployment data available to evaluate its real-world performance. Instead, its expected effectiveness is based on findings from existing research on stewardship initiatives and behavioral compliance. For instance, community-based tree stewardship programs are reported to minimize two-year tree mortality rates by around 25–50%. Similarly, Klasnja and Pratt found that user adherence rates can go up to 60–75% over only a 6-month period when mobile health applications are linked with active notifications. Although originating from digital health

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interventions, these studies provide relevant behavioral evidence regarding sustained engagement with notification-based mobile platforms.

All these results can help with the underlying design principles of the TSIP modules. However, they should not be interpreted as direct evidence of TSIP's effectiveness. Demonstrating the platform's actual impact will require a future controlled trial and empirical evaluation after deployment.

Discussion

This analysis identifies Uzbekistan's afforestation crisis as fundamentally an accountability and behavioral problem rather than a planting capacity problem. The platform directly targets this gap by providing irrigation and caring guidance, allocating individual care duties, and embedding stewardship within different mahalla communities. Existing conditions — including 72% smartphone access (ITU, 2023), affordable mobile data, and a national tree registry — make the platform design feasible.

Acknowledged TSIP limitations include dependence on the quality of data during registration, uncertainty regarding long-term gamification engagement, and the barriers faced by low-income users during image verification. These open questions reinforce the necessity of a structured empirical pilot before any claims of effectiveness can be made.

Conclusions

This paper presents the conceptual design and theoretical foundations of TSIP, a mobile stewardship platform intended to close the post-planting accountability gap undermining arid-zone national afforestation programs. The platform has not been deployed or tested; it represents a design artifact grounded in urban forestry science, behavioral economics, and citizen science theory, contextually anchored in Uzbekistan's Yashil Makon program.

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The framework's primary contribution is a structured design response to a well-documented but underaddressed problem: the behavioral and institutional gap between tree planting events and the sustained individual care that determines whether saplings survive. Its secondary contribution is a proposed two-arm randomized controlled trial — 500 trees per arm across five stratified sites with a 12-month survival rate as the primary outcome variable — as the empirical next step required to test whether the design performs as theorized.

TSIP is designed with regional transferability in mind. Should future evaluation support its effectiveness, the modular architecture is adaptable to analogous programs across Central Asia, the Sahel, the Arabian Peninsula, and other arid afforestation contexts — offering a potentially scalable model for converting planting ambition into lasting ecological outcomes.

References

1. Barton, D. N., et al. (2017). Citizen science for urban ecosystem services: concepts and practice in OpenTreeMap. International Journal of Biodiversity Science, Ecosystem Services & Management, 13(1), 338–350.
2. Bastin, J. F., et al. (2019). The global tree restoration potential. Science, 365(6448), 76–79.
3. Bonney, R., et al. (2014). Next steps for citizen science. Science, 343(6178), 1436–1437.
4. Bratman, G. N., et al. (2019). Nature and mental health: An ecosystem service perspective. Science Advances, 5(7), eaax0903.
5. Brandt, M., et al. (2019). Human population growth offsets climate-driven increase in woody vegetation in sub-Saharan Africa. Nature Ecology & Evolution, 1(4), 0081.
6. Chazdon, R. L., et al. (2017). When is a forest a forest? Ambio, 45(5), 538–550.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 2, Issue 3, March 2026

https://eurekaoa.com/index.php/5

7. Clayton, S. (2003). Environmental identity. In S. Clayton & S. Opsatow (Eds.), Identity and the natural environment (pp. 45–65). MIT Press.
8. Conway, T. M. (2016). Tending their urban forest. Urban Forestry & Urban Greening, 17, 23–32.
9. Daryo.uz. (2022, October 24). Yashil Makon program fiasco: 2.4 million trees die. https://daryo.uz/en
10. Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum.
11. Esperon-Rodriguez, M., et al. (2025). Urban tree growth and drought responses show evidence of climate resilience. Global Change Biology, e70281.
12. FAO. (2022). The State of the World's Forests 2022. FAO.
13. Giorgi, F., & Lionello, P. (2008). Climate change projections for the Mediterranean region. Global and Planetary Change, 63(2–3), 90–104.
14. Government of Uzbekistan. (2021). Presidential Decree No. UP-43: On the Yashil Makon National Afforestation Program.
15. Hamari, J., et al. (2014). Does gamification work? Proceedings of the 47th Hawaii International Conference on System Sciences (pp. 3025–3034). IEEE.
16. Hilbert, D. R., et al. (2019). Urban tree mortality: A literature review. Arboriculture & Urban Forestry, 45(5), 167–200.
17. IICAS. (2024). Uzbek project Yashil Makon wins international climate competition. https://iic-aralsea.uz
18. ITU. (2023). Measuring digital development: Facts and figures 2023. ITU.
19. Johnson, D., et al. (2016). Gamification for health and wellbeing: A systematic review. Internet Interventions, 6, 89–106.
20. Kahneman, D., & Tversky, A. (1979). Prospect theory. Econometrica, 47(2), 263–291.
21. Klasnja, P., & Pratt, W. (2012). Healthcare in the pocket. Journal of Biomedical Informatics, 45(1), 184–198.

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Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 3, March 2026

https://eurekaoa.com/index.php/5

22. Litvak, E., & Pataki, D. E. (2016). Evapotranspiration of urban lawns in a semi-arid environment. Journal of Arid Environments, 134, 87–96.
23. Liu, X., et al. (2022). Community-based environmental stewardship and civic culture in Central Asia. Central Asian Survey, 41(2), 245–261.
24. Meli, P., et al. (2017). A global review of active vs. passive restoration effects on forest recovery. PLOS ONE, 12(2), e0171368.
25. Nowak, D. J., & Crane, D. E. (2002). Carbon storage and sequestration by urban trees in the USA. Environmental Pollution, 116(3), 381–389.
26. Ostrom, E. (1990). Governing the commons. Cambridge University Press.
27. Oyserman, D. (2009). Identity-based motivation. Journal of Consumer Psychology, 19(3), 250–260.
28. Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking. Journal of Consulting and Clinical Psychology, 51(3), 390–395.
29. Roman, L. A., et al. (2014). Identifying common practices and challenges for local urban tree monitoring programs. Arboriculture & Urban Forestry, 39(6), 292–299.
30. UNDP Uzbekistan. (2023). Feasibility Study Report on Masterplanning for Afforestation – Yashil Makon. UNDP, Tashkent.
31. Vogt, J. M., et al. (2015). Explaining planted tree survival and growth in urban neighborhoods. Landscape and Urban Planning, 136, 1–12.
32. Zhang, Q., et al. (2017). Relationship of climatic and forest factors to drought- and heat-induced tree mortality. PLOS ONE, 12(1), e0169770.