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MODERNIZATION MECHANISMS OF TOURISM INFRASTRUCTURE IN DEVELOPING SUSTAINABLE AND INCLUSIVE TOURISM (ON THE EXAMPLE OF CHINESE EXPERIENCE)

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Abstract. *Tourism infrastructure has become a critical factor in destination competitiveness, sustainability and social inclusion. In this article, we will analyze the institutional and investment mechanisms that enabled China to modernise its tourism infrastructure between 1978 and 2025 and what can be learnt from Uzbekistan. The study will be based on systems analysis, comparative case analysis, institutional analysis, qualitative content analysis and SWOT and PESTEL assessment as well as inclusive infrastructure comparison against ISO 21902:2021. Ultimately, China's success is more about the integrated strategy of central planning, multi-actor coordination, blended financing, public-private partnerships and standardisation. This has led to the development of high-speed rail, digital tourism services and protected natural areas, but inclusive infrastructure is still not a worldwide best practice. The paper offers three conceptual models and proposes a phased modernisation strategy for Uzbekistan. Practical recommendations focus on institutional reform, transport connectivity, heritage and rural tourism, public-private partnerships, and the development of inclusive and environmentally sustainable tourism infrastructure for long-term destination competitiveness.*

Keywords: *tourism infrastructure; sustainable tourism; inclusive tourism; accessible tourism; smart tourism; public-private partnership; infrastructure modernisation; China; Uzbekistan; ISO 21902:2021.*

1. Introduction

Tourism is once again one of the world's most dynamic sectors of the economy. In 2025, international arrivals reached an estimated 1.52 billion and tourism exports reached USD 2.2 trillion [1] as a result of the unprecedented pandemic downturn in the world in 2025. The focus on tourism development has shifted from restoring visitor numbers to sustainable development, resilience and social inclusion. Tourism infrastructure is now at the center of everything we do to improve accessibility, the geographical distribution of tourism, environmental performance and the diversity of destinations. International discussions are built on two complementary perspectives. Sustainable tourism aims to balance economic development with environmental protection and community well-being under the Sustainable Development Goals [2].

Inclusive and accessible tourism (ISO 21902:2021) [3] provides everyone with equal access to tourism in a way that is inclusive and accessible through universal design and barrier-free

infrastructure. Digital transformation has also made data, connectivity and smart technologies a key part of modern tourism infrastructure [4]. China is a great example of modernisation in the tourism infrastructure. Over the past 40 years China has grown the largest domestic tourism market in the world with a huge high-speed rail network of more than 50,000 km [5], a national park system [6] and an extensive digital tourism service.

But more important than the scale of investment is the institutional mechanism by which coordinated policies, funding and implementation transformed infrastructure into a driver of sustainable and more inclusive tourism. These experiences are particularly relevant for Uzbekistan. Since 2016 the number of international visitors has increased strongly, supported by the Uzbekistan-2030 strategy [7], but regional connectivity, inclusive facilities, green infrastructure and institutional coordination remain major impediments to sustainable tourism development.

While a number of studies have already described China's tourism growth, there are few that are able to provide detailed insights into the institutional mechanisms in which policy, financing and infrastructure are connected from the perspective of sustainability and inclusion. A few studies have already taken into account institutional analysis, ISO 21902:2021 benchmarking and a context-specific adaptation model for emerging Silk Road destinations. In this work, we will reconstruct China's tourism infrastructure modernisation mechanism, evaluate its sustainability and inclusiveness, develop conceptual models of institutional processes and propose an evidence-based roadmap for Uzbekistan.

2. Literature Review

There are few existing studies that explain China's tourism growth but lack a clear understanding of institutional mechanisms of policy, financing and infrastructure delivery from a sustainability and inclusion point of view, especially from the perspectives of sustainability. Most of them also consider institutional analysis, ISO 21902:2021 benchmarking and a context-specific adaptation model for emerging Silk Road destinations. This study reconstructs China's tourism infrastructure development process and its sustainability and inclusiveness, conceptualising the institutional processes of modernisation, and develops a realistic and evidence-based perspective for Uzbekistan.

The accessible-tourism literature, led by Darcy and colleagues, reframed disability through a social-and-rights model and demonstrated that travel barriers are largely produced by unprepared destinations rather than by impairment as such [8]. Key contributions established the heterogeneity of access needs, linked accessibility to sustainability and competitiveness and traced the field's maturation from a niche concern into a strategic market [9], [10]. Universal design - creating environments usable by all without adaptation - supplies the design philosophy, and ISO 21902:2021 now codifies requirements across policy, the built environment, transport, information and training [3], [11].

A persistent critique is that practice lags principle: certification, reliable information and staff training remain weak even where physical access exists. A parallel stream conceptualises smart tourism as the convergence of information and communication technologies with the tourism experience, enabled by interconnected stakeholders, big data and a public-private digital ecosystem [4]. Scholars stress that smartness is as much an institutional and data-governance achievement as a technological one propose models for sustainable smart destinations, and examine the smart

tourist's co-creative role; the pandemic intensified calls for transformative, technology-enabled research [12]. Critically, digital systems can either widen or narrow inclusion, depending on whether accessibility is designed in.

Indeed, studies of China also concern cultural-policy foundations, demand dynamics, and the tourism effects of transport infrastructure. An extensive body of quasi-experimental data shows that high-speed rail increases tourist arrivals and revenue, alters the spatial structure of urban tourism, and benefits inland and less-developed regions with high levels of tourism to these regions, but also concentrates these flows in hubs [13], [14].

Rural revival studies connect infrastructure to village tourism and income diversification [15]. However, these studies are sectoral and econometric in nature: they only measure the effects of the particular asset but do not describe the institutional mechanism that drives the asset base. In this field, these literatures are complementary, but are disconnected.

Competitiveness models call infrastructure but not its production [16]; sustainability and inclusion scholarship sets normative benchmarks but rarely looks at delivery mechanisms in fast-modernising states; smart-tourism research focuses on technology and not institutions, and China-specific studies take into account the impact of single assets. What is missing is an integrated, mechanism-level view on how a developing state coordinates strategy, financing, delivery and feedback to modernise infrastructure at the same time for competitiveness, sustainability and inclusion and how this can be translated into a well-structured and standards-compliant adaptation strategy for another developing destination. This is our contribution to fill that gap.

3. Research Methodology

The study is based on four complementary approaches. Institutional analysis examines the governance structure of tourism infrastructure including central authorities, local governments, state-owned enterprises and private partners. Qualitative content analysis of policy documents, statistical reports and national strategies identifies the major policy instruments and development priorities. SWOT analysis assesses the strengths, weaknesses, opportunities and threats of China's tourism infrastructure mechanism from sustainability and inclusion perspectives and PESTEL analysis analyzes political, economic, social, technological, environmental and legal conditions that are driving its development and transferability. Findings are distilled into three conceptual models. The analysis is conducted in two ways: a vertical analysis of the evolution of China's modernization process, followed by a horizontal comparison benchmarking inclusive infrastructure against ISO 21902:2021 and assessing its applicability to Uzbekistan. The study draws on UN Tourism [1], the World Economic Forum [17], the OECD [18], the World Bank [19], ISO standards [3], Chinese and Uzbek government publications and peer-reviewed literature to ensure triangulation and to avoid single-source bias.

4. Analysis and results

This mechanism is a four-stage cycle (Figure 1). National development plans define strategic targets and are executed together by tourism, transport and environmental authorities. Financing combines fiscal investment, local-government special-purpose bonds, public–private partnerships and state-owned enterprises. Infrastructure delivery is done on an ongoing basis; monitoring systems, destination ratings and digital data are used to keep pace.

Thus the mechanism itself, instead of individual projects, is the reason why China's modernisation has been successful. The most visible of its effects is transport connectivity. By 2025 China's high-speed rail network surpassed 50,000 km connecting most of its major cities and driving tourism to the mainland, reducing travel time and encouraging people to go inland [5]. The airport expansion was also on the way of regional accessibility, and overcrowded cities were less stressed.

Digital infrastructure is a second big success. The mass adoption of 5G in the country, online booking and smart ticketing and real-time visitor information have all made digital infrastructure available to tourists. A harmonized public–private digital ecosystem that integrates government standards and data management with private sector service delivery greatly enhances the efficiency and sustainability of smart tourism development [4].

The recent development of China's tourism infrastructure has improved environmental sustainability by establishing national parks, eco-tourism facilities, better visitor management and high-speed rail but long term success will require the balance between conservation and tourism and its growth [6].

Rural transport and tourism facilities have also helped to drive rural tourism growth and local incomes [15]. But inclusive infrastructure is still relatively underdeveloped and there is very little in terms of barrier-free facilities, accessibility information and certification in line with ISO 21902:2021.

In general, China's experience shows that modernisation of tourism infrastructure is less about the number of investments and more about the institutional coordination of planning, financing, implementation and monitoring of the system. This coordinated strategy has been instrumental for bringing connectivity, digitalisation, environmental sustainability and rural development forward and the slow pace of inclusion highlights the need for accessibility to be more firmly integrated in future tourism policy.

Table 1. Stages of tourism infrastructure modernisation in China (author's elaboration based on [5], [6], [13])

Stage	Period	Policy focus	Infrastructure priorities	Representative outcomes
I. Foundation	1978–1999	Open the economy; build capacity for inbound tourism	First international-standard and joint-venture hotels; basic transport; sector administration	Emergence of an organised inbound sector and a national tourism authority
II.Scale expansion	2000–2012	Mass domestic tourism after WTO accession; regional development	Expressways, airports, first high-speed line (2008); large-scale hotel and resort capacity	Domestic market becomes the growth engine; rapid superstructure expansion

Stage	Period	Policy focus	Infrastructure priorities	Representative outcomes
III.Quality and connectivity	2013–2019	High-quality, all-for-one tourism; Belt and Road; smart-tourism pilots	HSR densification; upgrading of top-rated scenic areas; early digital platforms	Improved connectivity and product quality; foundations of smart tourism
IV.Smart and green consolidation	2020–2025	High-quality and beautiful development; digital, green and inclusive goals	5G and digital systems; national parks (2021); rural and barrier-free facilities; HSR beyond 50,000 km	World-leading connectivity and digital capacity; protected-area backbone; emerging inclusion agenda

While China has made great progress in connectivity and digitalisation, inclusive tourism infrastructure is still less developed. As outlined in accessible tourism literature and ISO 21902:2021, inclusion is not only about physical access but also accessible information, communication, staff training and universal design [3], [8]. China has made significant investments in new airports, high-speed rail stations, museums and hotels with barrier-free design features such as lifts, tactile paving and accessible facilities. Because much of this infrastructure is new, accessibility is more well integrated in countries that need retrofitting than in countries that have retrofitting. But there are still some gaps. Accessibility information is at times patchy, certification systems are limited and staff training is uneven, which limits the practical reach of physical improvements. Digital travel has increased travel opportunities but access to booking and navigation systems can create new barriers for travellers with disabilities [10]. Community participation - especially the involvement of disability organisations in planning and evaluation - is also low. In general, China has shown that institutional coordination is enough to achieve a great infrastructure modernisation. But inclusive tourism has been slower to reach the public, as standards of access, certification, information systems and stakeholder engagement have not yet been integrated in policy-financing-implementation. These findings are the basis for benchmarking against ISO 21902:2021 and the development of an inclusive tourism infrastructure model for Uzbekistan.

Table 2. Inclusive tourism infrastructure: ISO 21902:2021 versus Chinese practice (author's analysis based on [3], [8], [10], [11])

Dimension	ISO 21902:2021 requirement	Chinese practice	Strength / gap	Lesson for Uzbekistan
Policy and strategy	Accessibility embedded in tourism policy and destination strategy	Inclusion present in policy discourse but not a hard, monitored target	Gap	Make accessibility a measurable objective of the

Dimension	ISO 21902:2021 requirement	Chinese practice	Strength / gap	Lesson for Uzbekistan
				national tourism programme
Built environment	Barrier-free design across the value chain	Strong in new airports, stations, museums and flagship hotels; weaker in older and secondary stock	Strength (new build)	Design access into new and restored facilities from the outset
Transport	Accessible, connected transport chains	Accessible features in new HSR and air hubs; uneven last-mile links	Mixed	Ensure accessible transfers, not only accessible terminals
Information and digital	Reliable, comparable accessibility information	Fragmented information; variable application accessibility	Gap	Build a single trusted accessibility-information layer into digital platforms
Training and certification	Trained staff and recognised certification	Limited independent certification; uneven training	Gap	Adopt certification, accessibility-audit and training schemes
Community participation	Involvement of persons with disabilities	Less institutionalised consultation	Gap	Institutionalise consultation with organisations of persons with disabilities

China's tourism infrastructure model cannot be transferred directly to Uzbekistan due to the vast differences in economic scale, fiscal capacity and institutional conditions. However, its underlying mechanism-clear strategic planning, inter-agency coordination, blended financing and continuous monitoring-offers some lessons. Uzbekistan's rapid growth in tourism since 2016, growing international tourists and increased social tourism initiatives provide a good basis to apply this model to the country. A long-term coordination mechanism between tourism, transport, finance, regional authorities and cultural heritage bodies is the first step in this direction. A national tourism infrastructure programme that is clear and measurable in terms of sustainability and inclusion will be better coordinated and implemented. As public resources are limited, the expansion of public–

private partnerships (PPP), transparent concession structures and blended financing can bring in new investment and relieve fiscal strain.

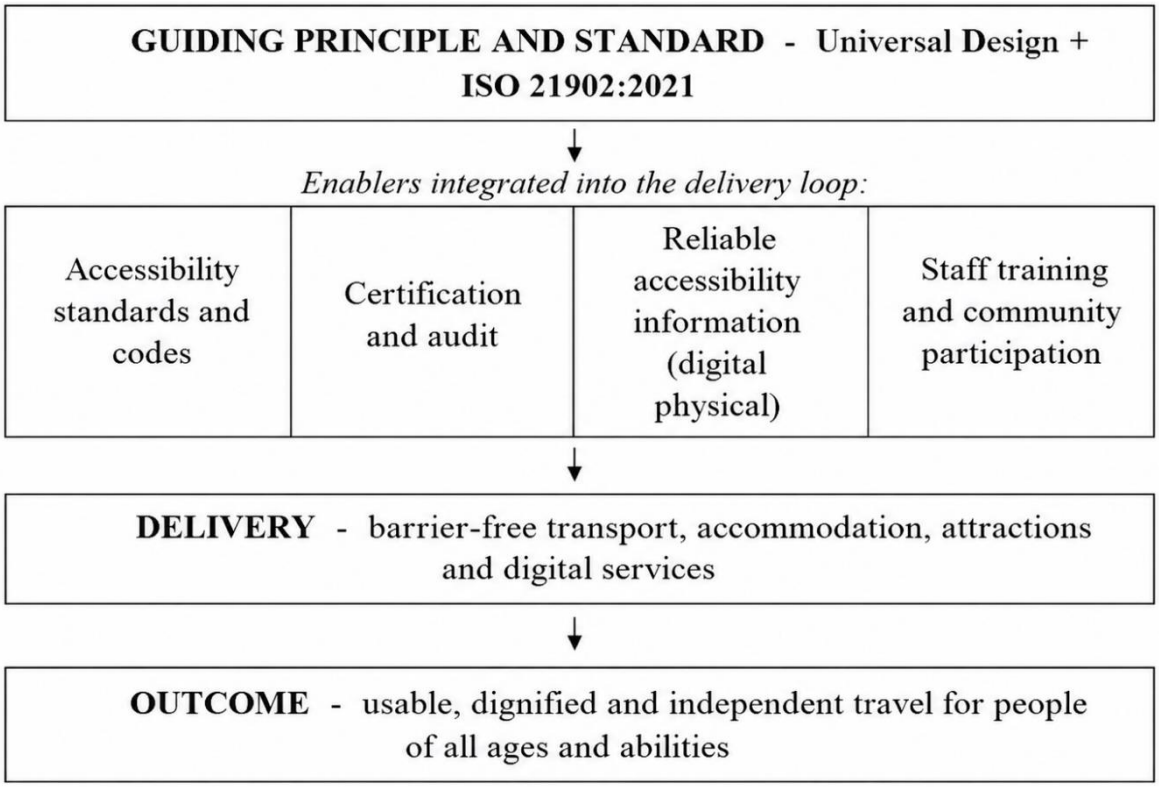

Figure 2. Inclusive tourism infrastructure modernisation mechanism (author's conceptual model)

Transport connectivity should be the main investment priority. Modernising airports, making rail connections between Tashkent, Samarkand, Bukhara and Khiva, and upgrading the regional road networks would make them more accessible and disperse visitor flows and promote tourism beyond the main tourist destinations. At the same time, investments in rural roads, utilities and tourism facilities could drive rural tourism, diversify local economies and prolong the tourism season. Sustainable heritage management is also very important. The development of infrastructure must preserve UNESCO World Heritage sites and improve visitor services and tourism in mountain, desert and rural destinations. Accessibility and sustainability should be integrated into all new projects from the beginning rather than later. Following ISO 21902:2021 as the national benchmark, setting accessibility standards, certification systems, staff training and reliable accessibility information would help Uzbekistan to address the institutional deficiencies of China's experience. Partnering with a range of organizations that are dedicated to persons with disabilities should be an increasingly common practice in tourism planning. Digital transformation can complement physical infrastructure by providing access to tourism information services, online booking systems, accessibility information and visitor-flow management to help tourists. That would ensure a better experience for the tourists and data to inform policy making for a more evidence-based policy. Based on these priorities, Uzbekistan should design a phased roadmap: first, strengthening institutional coordination, introducing ISO 21902:2021, extending PPP mechanisms and launching digital and accessibility pilot projects; second, upgrading transport infrastructure, creating regional tourism

clusters and expanding green and barrier-free infrastructure; and finally, establishing a nationwide system of connected, inclusive, sustainable and smart tourism infrastructure with continuous monitoring and evaluation.

Table 3. Roadmap for adapting the Chinese experience to Uzbekistan (author's elaboration)

Direction	Current status	Chinese practice	Recommended action	Expected outcome
Institutional coordination	Fragmented, project-based decision-making	Multi-actor coordination under national strategy	Standing inter-agency body and single monitored programme	Coherent, target-driven infrastructure delivery
Investment and PPP	Emerging PPP; limited risk-sharing tools	Blended finance, PPP and special-purpose bonds	Standardised PPP framework and de-risking guarantees	Larger, sustained private capital inflow
Connectivity	Airports modernising; rail links improving	World-leading HSR and intermodal integration	Accelerate inter-city rail and airport upgrades; intermodal links	More arrivals dispersed beyond flagship cities
Heritage and regional tourism	Concentration in Samarkand, Bukhara, Khiva	All-for-one tourism and destination clusters	Develop secondary clusters; protect heritage capacity	Reduced over-concentration; broader regional benefit
Rural and mountain tourism	Nascent; limited village infrastructure	Rural-revitalisation infrastructure model	Village roads, utilities and facilities; product development	Diversified product; rural income and jobs
Inclusive infrastructure	Early social-travel support measures	Accessible new build; soft-infrastructure gap	Adopt ISO 21902:2021; codes, certification, information, training	Usable, dignified travel for all; new market segment
Green and eco tourism	Growing eco-tourism interest	National parks and protected-area backbone	Protected-area planning; low-impact and renewable facilities	Lower footprint; conservation-aligned growth
Digital transformation	Expanding online services	5G, smart platforms, data-driven management	National accessible digital-tourism platform and capacity tools	Better experience and real-time feedback data

This study builds on theory and practice by providing a mechanism-based perspective of tourism infrastructure modernisation. It first defines modernisation as an institutional cycle that links strategy, financing, implementation and feedback and not investment alone. Second, it creates a four-step model for China's tourism infrastructure evolution and demonstrates that the institutional coordination is still there even at the expense of changing policy priorities. Third, China's inclusive tourism infrastructure is compared to ISO 21902:2021 and information on accessibility, certification and staff training is still lacking. Fourth, it introduces an inclusive infrastructure model that incorporates universal design, standards, and stakeholder involvement into infrastructure delivery. Lastly, it proposes a context-tailored mechanism and phased roadmap for Uzbekistan, saying that the success of modernisation is predicated on institutional coordination and not just on capital investment. In light of these findings, the study suggests strengthening inter-agency coordination, adopting ISO 21902:2021, expanding public-private partnerships and blended financing, improving transport links, supporting rural and heritage tourism, integrating accessibility and universal design of new projects, building national digital tourism platforms, strengthening professional training, involving local stakeholders and promoting green infrastructure to achieve sustainable and inclusive tourism development.

5. Conclusion

This study draws on theory and practice as it provides a mechanism-based perspective for tourism infrastructure modernisation. First it considers modernisation as an institutional process of strategy, financing, implementation and feedback and not just a matter of more investment. Second, it creates a four-stage model of the development of China's tourism infrastructure and shows that there is continuity in institutional coordination despite policy shifts. Third, it benchmarks China's inclusive tourism infrastructure with ISO 21902:2021 and identifies gaps in accessibility information, certification and staff training. Fourth, it introduces an inclusive infrastructure model in which universal design, standards and stakeholder participation are integrated into the delivery of infrastructure. And finally, it proposes a context-driven mechanism and a phased roadmap for Uzbekistan that modernisation is based on institutional coordination, not capital investment. Based on these findings, the report calls for stronger inter-agency coordination, adoption of ISO 21902:2021, better public-private partnerships and blended financing, better transport connectivity, promotion of rural and heritage tourism, inclusion of accessibility and universal design in new developments, development of national digital tourism platforms, professional training and involvement of stakeholder organisations, and developing green infrastructure for sustainable and inclusive tourism development.

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