

In collaboration with  
Cappadocia University



# Driving Türkiye's Travel and Tourism Development: The Challenges and Opportunities of Using Big Data for Sustainable Growth

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# Foreword



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Just as demand for travel and tourism (T&T) reaches pre-pandemic levels worldwide, global challenges such as climate change and inflation have become more acute, while travellers become more conscious of their impact on the environment and local communities. Therefore, creating more sustainable and resilient tourism destinations has become critical for future competitiveness. Moreover, in large T&T economies such as Türkiye, sustainable sector development can greatly address broader social, economic and environmental challenges. In response, the Turkish Ministry of Culture and Tourism's 2028 Tourism Master Plan identifies the need to create a tourism sector that is competitive, sustainable and inclusive. This includes improving the sector's environmental performance, enabling tourism as a tool for regional development and ensuring that visitors have full access to tourism products and services.

Based on rapid digitalization and the surge in data produced in tourism and beyond, big data analytics offers an increasingly powerful tool for achieving these plans. Big data provides a new way to track and manage T&T's social, economic and environmental impact, increasing the effectiveness of tourism policy-making.

In this context, we have set out to publish an analysis that asks several important questions:

- What are Türkiye's sustainability challenges and how do they relate to its overall T&T-enabling landscape?

- How can big data be leveraged to address the country's T&T sustainability challenges and unlock the sector's potential for socioeconomic development?
- What are the country's current T&T data policies, common challenges and readiness for applying big data for T&T management?
- What steps can policy-makers take to drive greater use of big data for sustainable, inclusive and resilient T&T growth?

Following the World Economic Forum's multistakeholder approach, this report is based on thought leadership and research collaboration between the Forum and Cappadocia University and includes input from industry experts and a survey of local Turkish T&T stakeholders. Moreover, the publication builds on ongoing Forum work, including the use of the Travel and Tourism Development Index, a tool for benchmarking and measuring the set of factors and policies that enable the sustainable and resilient development of the T&T sector, which in turn contributes to the development of a country.

We hope that the report's findings will not only help Turkish policy-makers to better understand how to leverage big data for sustainable T&T development but will also drive discussion and inspire action among the broader tourism community within and beyond Türkiye.

# Executive summary

Big data analytics, supported by digitalization and the wealth of data produced, can help Türkiye's policy-makers create a competitive, sustainable tourism economy.

With international visitor numbers and tourism income expected to exceed 2019 levels in 2023, Türkiye's travel and tourism (T&T) sector is now recovering from the sharp declines of the COVID-19 years. Moreover, accounting for about 11% of overall GDP,<sup>1</sup> the sector's role in the country's socioeconomic development has never been more vital. It is also becoming increasingly clear to policy-makers in Türkiye and beyond that the sector's future competitiveness and success will rest on sustainable development that accounts for tourism's economic, social and environmental impacts. However, to achieve this, new tools will need to be developed to measure and monitor the sector's impact and implement policies in a timely manner. In this context, big data analytics, supported by the growth of T&T digitalization and the resulting explosion in data produced, offers one such solution.

The World Economic Forum, with support from Cappadocia University, has published this paper to highlight for Türkiye's T&T policy-makers and other stakeholders the challenges and opportunities presented by the use of big data for sustainable and resilient T&T growth.

The paper's key findings show the following:

## **Türkiye has a conducive enabling environment for T&T but faces several sustainability challenges:**

Türkiye's performance in the Forum's Travel & Tourism Development Index 2021 highlights the country's potential for T&T development. The results illustrate the advantages of tourism enablers such as rich cultural and natural resources and leading air-transport infrastructure and services. However, the index results also indicate that Türkiye's T&T sector faces sustainability challenges such as environmental degradation, the need to further promote inclusive T&T development and demand pressures caused by factors such as high seasonality and the over-concentration of tourism in a few regions. Türkiye's tourism authorities aim to tackle these challenges with new national tourism plans and initiatives that integrate the concept of sustainability.

## **Big data can be used to address the country's sustainability challenges, enabling a more competitive and resilient T&T sector:**

Collecting and analysing data from various sources such as online travel agencies (OTAs), sharing-economy platforms, digital payment systems and mobile devices allows big data techniques and technologies to track and manage the social, economic and environmental impacts of T&T more effectively and often in real time. As a result, it becomes easier to manage tourism flows, target preferred markets and create smart destinations. Big data can also be used to track visitor behaviour across different seasons and destinations, control load capacity and monitor long-term environmental trends. By processing large and diverse datasets, big data supports the creation of strategic plans and development programmes, enhancing the effectiveness and responsiveness of sustainability policies.

## **To unlock the potential of big data, policy-makers in Türkiye need to focus on several readiness factors:**

Türkiye has made strides in prioritizing sustainability and big data. However, research and survey results indicate that improving Türkiye's readiness for the use of big data in T&T will require further investment in areas such as information and communications technology (ICT) infrastructure and access, skills building, multistakeholder collaboration, managing national sustainability criteria, data privacy frameworks and addressing inherent big data limitations.

## **Policy-makers can take several steps to enhance the use and benefits of big data for sustainable, inclusive and resilient T&T growth:**

This includes: aligning T&T sustainability policy and challenges with big data opportunities and ecosystem capacity; developing a governance framework, funding mechanisms and institutional capacity; building human capital; encouraging T&T digitalization and ICT investment; and ensuring data privacy and security.



1

# Global context

The future of T&T will depend on sustainable growth and taking advantage of the opportunities offered by digitalization and big data.





## 1.1 Sustainability will be vital for future T&T development and growth

The travel and tourism (T&T) sector is undergoing a transformation. While international tourist arrivals more than doubled in 2022 to about 962 million, they remain more than 30% below 2019 levels.<sup>2</sup> Moreover, challenges such as COVID-19 restrictions, supply-chain disruptions, labour shortages, inflation, recession concerns and geopolitical tensions represent obstacles to T&T development. The sector is also coming under growing pressure to adapt to longer-term headwinds such as climate change and evolving business dynamics caused by the rapid pace of T&T digitalization and new traveller demands. Within this context, T&T decision-makers are evaluating how best to not only encourage T&T's growth but also ensure that this vital engine of economic and social progress becomes more resilient in the face of a multitude of obstacles and risks. A key component of any such approach will be sustainable T&T development.

The United Nations Environment Programme (UNEP) and the World Tourism Organization (UNWTO) define sustainable tourism as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities".<sup>3</sup> Only by effectively managing these factors can a destination

maximize its long-term competitiveness and development potential. Addressing sustainability challenges will most likely boost competitiveness by protecting tourism operations from headwinds caused by human-induced climate change, natural disasters, health hazards and other crises, by increasing the quality of human resources in the destinations and by preventing societal and regulatory blowback from unsustainable and non-inclusive business practices.<sup>4</sup> Moreover, given that T&T accounts for an estimated 11% of global carbon emissions,<sup>5</sup> reducing sector emissions will be critical to any efforts to meet the goals of the Paris Agreement to keep global temperatures below 2°C, thereby minimizing the impact of climate change.

On the demand side, recent survey results indicate that consumers are also increasingly considering sustainability in their travel decisions. According to one survey by Kind Traveler, 96% of travellers agree that it is important to them that their travel spend makes a positive impact on the places they visit, while another study by Expedia shows that 69% of respondents want to lessen their environmental impact and about 65% would want to support local economies, cultures and communities. Investors are also increasingly considering sustainability factors in their investment decisions.<sup>6</sup>

## 1.2 The big data and digitalization opportunity

Digitalization and big data provide powerful tools for sector sustainability efforts. Before the COVID-19 pandemic, nearly 50% of global bookings took place online.<sup>7</sup> Increasingly, T&T services are accessed by or are dependent on search engines, online travel agencies (OTAs), global distribution systems (GDSs), sharing-economy platforms, direct online bookings, digital payment systems and mobile devices. Consumers are increasingly accustomed to using digital T&T services to improve convenience, increase service options and enable seamless travel experiences. On the other side, T&T businesses are using digital tools and data to reach new market segments, gain customer insights and improve operational efficiency.<sup>8</sup> According to the World Economic Forum's *Future*

*of Jobs Report 2023*, technologies such as big data analytics, cloud computing, digital platforms and apps, the internet of things and connected devices, and e-commerce are all expected to generate positive net employment in the accommodation, food and leisure industry.<sup>9</sup>

As the digitalization of T&T continues, big data presents an opportunity to enable sustainable tourism management and recovery. Data from sources such as credit card transactions, mobile devices and traffic sensors can be used to track and manage the social, economic and environmental impact of T&T, complement more traditional data-collection efforts and manage destination capacity.<sup>10</sup>

2

# Türkiye's T&T development and sustainability landscape

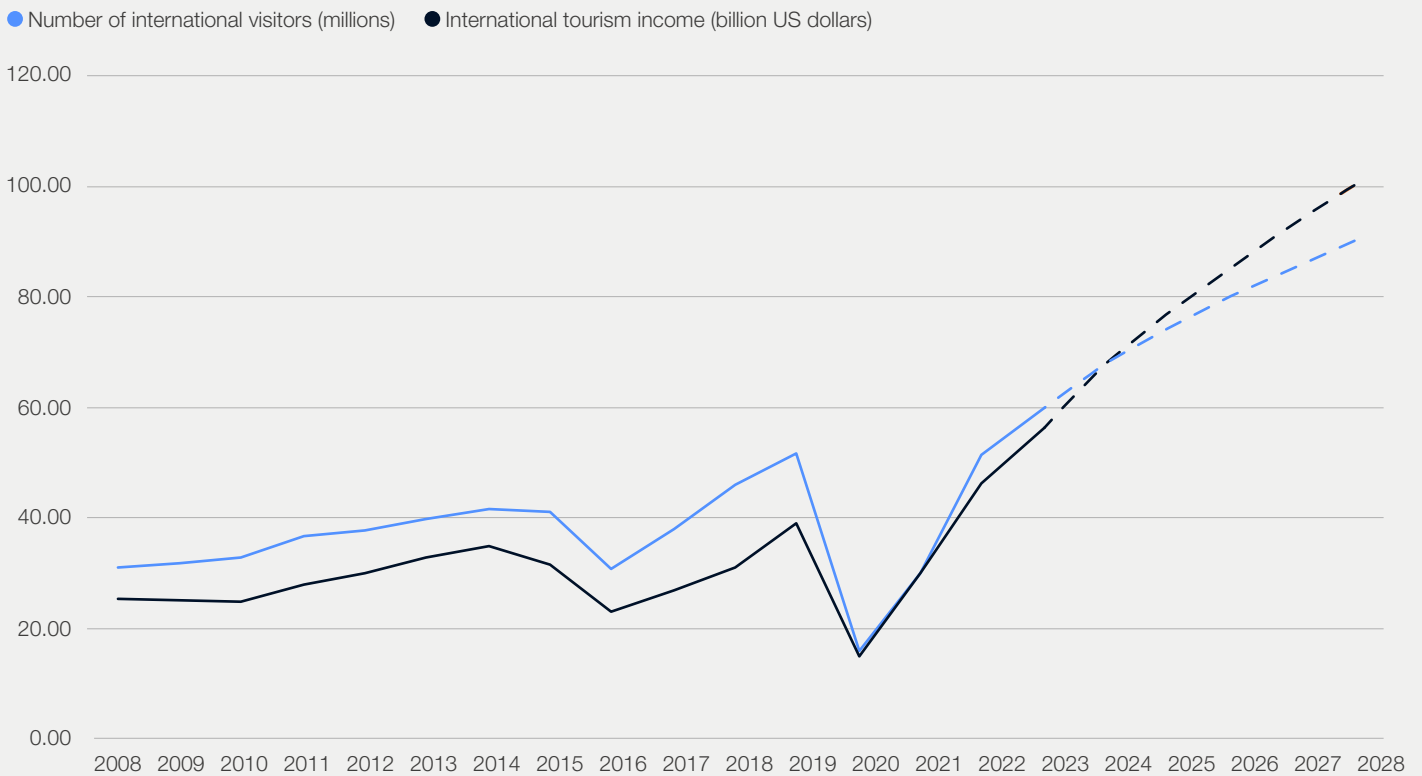
Türkiye has a conducive enabling environment for T&T, but faces several sustainability challenges.

## 2.1 Country context

T&T is an important economic pillar in Türkiye. Contributing 11% to the country's gross domestic product (GDP) and 9.2% to total employment in 2019, tourism generated 2.6 million jobs in Türkiye,<sup>11</sup> boosting regional and rural development. As Figure 1 highlights, by the end of 2023,

international tourism demand is forecast to recover fully. Nevertheless, tourism in Türkiye was hit hard by the COVID-19 pandemic. Official figures indicate a 69% drop in the number of visitors and a 65% loss of tourism income in 2020 compared to the previous year.<sup>12</sup>

FIGURE 1 Türkiye: the number of international visitors and income



Note: Figures for 2023 and beyond are forecasts.

Source: Republic of Türkiye Ministry of Culture and Tourism, Official Tourism Indicators, 2023

In this context it was critical for Turkish T&T stakeholders to re-evaluate the country's sector development and competitiveness strategies to boost growth, including rethinking the future of tourism and basing future growth on sustainability. The Turkish Ministry of Culture and Tourism has already started this shift, revising its strategy in 2020 in the light of new developments caused by the COVID-19 pandemic, as seen in the updated 2028 Tourism Master Plan, which is based on competitiveness and sustainability. The government aims to not only create a tourism sector that is competitive, sustainable and inclusive, including improving the sector's environmental performance,

but to also enable the use of tourism as a tool for regional development and ensure that all visitors have full access to tourism products and services.<sup>13</sup> To this end, the Ministry of Culture and Tourism is collaborating with various local, national and international stakeholders and academic institutions to redesign sustainable tourism policies and initiatives in Türkiye.<sup>14</sup>

A better understanding of the economy's T&T strengths and challenges, including those in T&T sustainability, can help inform strategies such as the Tourism Master Plan.



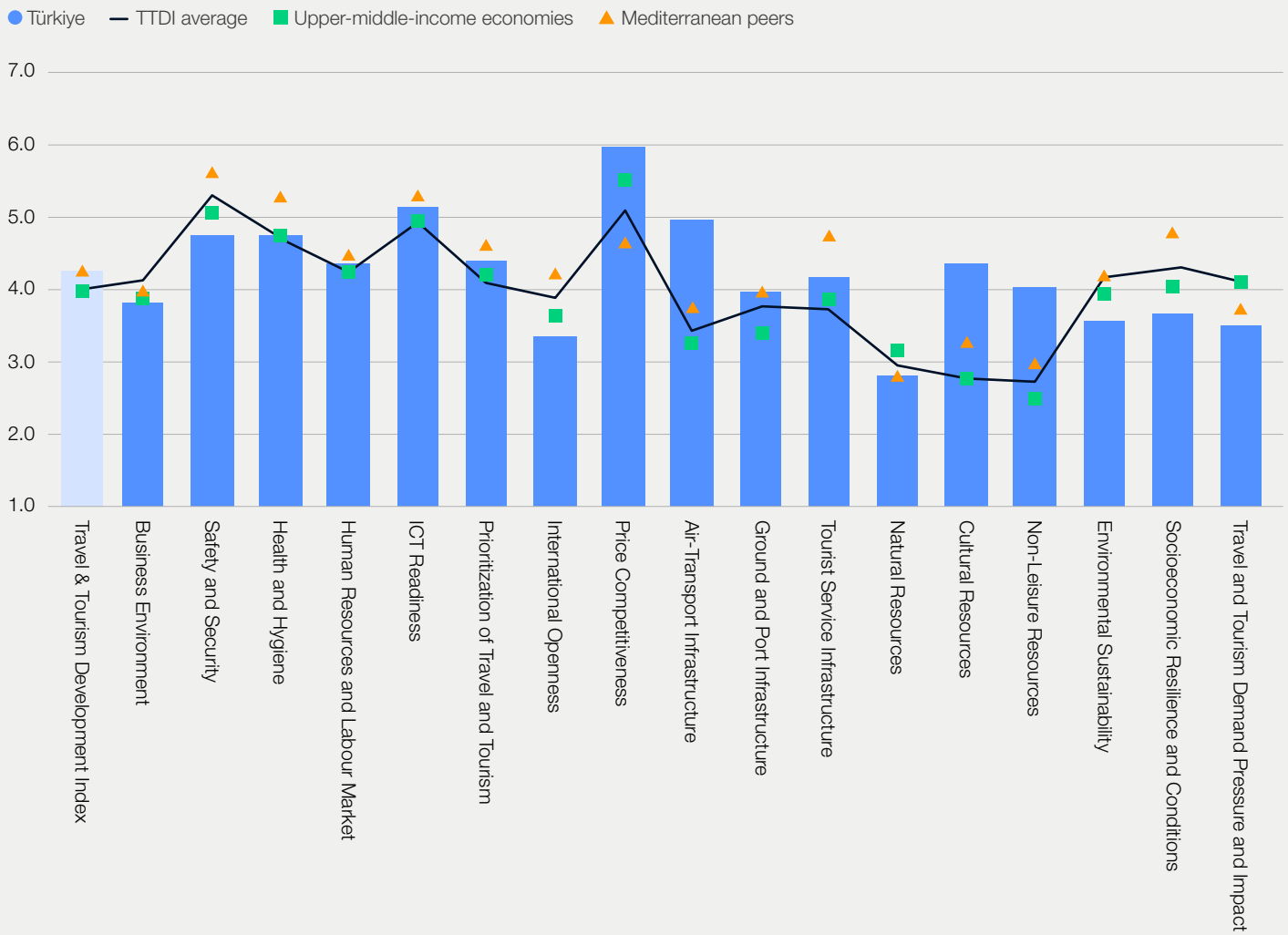
## 2.2 Türkiye's T&T-enabling landscape

The World Economic Forum's Travel & Tourism Development Index (TTDI) 2021 is a useful tool to help identify Türkiye's T&T strengths, challenges and opportunities for improvement. The index benchmarks and measures the factors and policies that enable the sustainable and resilient development of T&T. Covering 117 economies, it is composed of 17 pillars based on 112 indicators, with each pillar representing an important enabler of T&T development, such as business environment and infrastructure. The findings of the 2021 index stressed the need for the T&T sector to rebuild in an inclusive, sustainable and resilient manner after the pandemic in order for the sector to maximize the benefits for local communities.<sup>15</sup> Moreover,

the TTDI has three pillars specifically focused on T&T sustainability: Environmental Sustainability; Socioeconomic Resilience and Conditions; and T&T Demand Pressure and Impact.

Despite the negative impact of the COVID-19 pandemic, TTDI results indicate that Türkiye's capacity to enable T&T development has improved in recent years, with its index ranking climbing from 49th in 2019 to 45th in 2021. As Figure 2 highlights, Türkiye outperforms upper-middle-income countries that are its global economic peers and scores close to the average of Mediterranean Basin economies, to which Türkiye belongs.

FIGURE 2 | Türkiye's Travel & Tourism Development Index 2021 performance



**Note:** More information on the Travel & Tourism Development Index and income-group classification can be found at <https://www.weforum.org/reports/travel-and-tourism-development-index-2021#report-nav>. Mediterranean peer economies are Albania, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Montenegro, Morocco, Portugal, Slovenia, Spain, Tunisia and Türkiye.

**Source:** World Economic Forum

Tourism demand in Türkiye is sustained by advantages in cultural (13th out of 117) and non-leisure (23rd) resources. Cultural advantages include a significant collection of United Nations Educational Scientific and Cultural Organization (UNESCO) World Heritage cultural sites (10th), large sports stadiums (16th) and UNESCO creative cities (12th). Meanwhile, non-leisure travel benefits from a high concentration of quality universities (10th) and highly globalized and interconnected cities such as Istanbul (24th). T&T in Türkiye is also facilitated by leading air-transport infrastructure (14th) that is based on a large number of operating airlines (11th) and highly connected airports (13th), which deliver favourable perceptions of efficiency in air-transport services (9th). Moreover, Türkiye also has an advantage in price competitiveness (18th). However, global inflation has increased since the index was published.

Türkiye also has several opportunities for improvement. These include below-average marks for international openness (75th), safety and security (90th) and (increasingly important post-pandemic) health and hygiene (63rd). Additionally, despite outperforming the global average, when compared to its Mediterranean Basin peers, the Turkish T&T sector would benefit from greater improvement in tourist services (37th), ground and port infrastructure (40th) and prioritization of T&T (33rd). Issues in business environment (64th), human resources and labour market (56th) and ICT readiness (52nd) also exist. As will be discussed later in this paper, many of these factors are related to the use of big data and generating sustainable T&T growth.

## 2.3 Türkiye's T&T sustainability challenges

The TTDI results indicate that Türkiye faces several challenges when it comes to T&T sustainability; addressing these will be fundamental to the sector's competitiveness and long-term development. These challenges are mostly related to environmental sustainability, managing tourism demand and the need to improve the T&T sector's ability to drive inclusive economic development.

### Environmental sustainability

The long-term prosperity of the T&T sector in Türkiye hinges on addressing and building resilience in the face of climate change, pollution and environmental degradation. The country has a diverse and rich ecosystem, exemplified by a large number of ecoregions (13th), which help generate strong demand for nature-based tourism, as indicated by the growing number of online searches for the country's nature assets and related activities (38th in 2019 to 21st in 2021). However, ranking in 102nd place, the economy scores below average for the TTDI's Environmental Sustainability pillar. As a result, the economy's destinations and its tourism-generating natural resources are at greater risk. For instance, Türkiye scores more than 20% below the index average for water stress, with most of its Aegean and Mediterranean coasts under high stress and at medium-high risk of water depletion.<sup>16</sup> This is a significant concern as climate change and human development put the fresh-water resources of the country's popular beach destinations under pressure. Deforestation, droughts, fires and air pollution (exceeding World Health Organization recommendations) create further risks for nature-based tourism. TTDI results indicate that deforestation has accelerated in recent years (41st in 2019 to 43rd in 2021). Below-average perceptions of nature protection (98th) and business impact on the environment and nature (82nd) may also indicate room for improving nature preservation efforts.

### Inclusive development and demand management

The TTDI highlights that the use of the T&T sector's potential for widespread economic benefits can be further improved. Excessive tourism growth can lead

to issues such as overcrowding, resource damage, strained infrastructure, increased housing prices and reduced liveability for residents. If left unaddressed, such issues can lead to a backlash by residents against tourism, reduce visitor satisfaction and lower overall destination attractiveness.<sup>17</sup> Türkiye's TTDI scores 103rd for the Demand Pressure and Impact pillar, indicating overcrowding and demand-volatility risks. The country grapples with challenges such as high seasonality (96th), short lengths of stay (65th) and overcrowding risks, with perceptions suggesting a need for better geographical dispersion (96th) and reduced city-centre crowding (80th).

For example, while international tourist arrivals increased by more than 60% from 2010 to 2019, much of the sector's concentration lies in a few regions. Antalya and Istanbul alone account for almost 50% of all tourists and 80% of international visitors, leading to concentrated tourism infrastructure, with these destinations holding 48% of hotel beds.<sup>18</sup>

Türkiye also scores below average for the Socioeconomic Resilience and Conditions pillar (77th). Challenges such as low perceptions of equal workforce opportunities (100th), gender inequality (59th), worker rights (83rd) and above-average rates of youth not in employment, education or training (86th) all diminish T&T sector access to skilled and productive labour, reducing sector dynamism and resilience to potential future shocks.<sup>19</sup> In particular, the nation's need to increase the participation of its female labour force is evident, with women comprising only 23.1% of T&T sector employment, far below the G20 average of 46.4%.<sup>20</sup> As a result, the sector is deprived of a major source of labour, simultaneously limiting its potential for socioeconomic development. Supporting micro, small and medium enterprises (MSMEs) is also crucial to ensuring an inclusive and resilient T&T sector. Most T&T-related businesses are MSMEs and thus lack the means to survive extended declines in tourism demand and shutdowns, making them disproportionately at risk from the impact of headwinds such as COVID-19.<sup>21</sup>



## 2.4 Efforts to address T&T sustainability challenges

As already mentioned, the Turkish government has integrated sustainable T&T development into its 2028 Tourism Master Plan, launching several strategies and initiatives that aim to address T&T sustainability challenges. Türkiye is home to the world's third-largest number of Blue Flag beaches, demonstrating a focus on preserving natural resources. Beaches certified by the Blue Flag recognition scheme, which is run by the Foundation for Environmental Education, meet stringent environmental standards such as regular testing of the water for health risks and protection of the natural surroundings.<sup>22</sup> To help ensure that tourism development benefits are shared more broadly, the Türkiye Tourism Promotion and Development Agency (TGA) has established the Province Promotion and Development Programme, which includes participants from government, the private sector, academia and civil society and aims to enhance the tourism potential of all 81 provinces in Türkiye, ensuring more effective promotion of destinations nationally and internationally to increase the digital visibility of destinations and strengthen the branding processes through synergy in province promotion. To help address the labour shortage, promote youth employment and improve inclusive development, the Ministry of Culture and Tourism and the Ministry of National Education have signed a protocol that requires students studying in the fields of Accommodation and Travel Services, Food and Beverage Services and Entertainment to undertake skills training and internships in T&T enterprises.<sup>23</sup>

The TGA has also launched Türkiye's Sustainable Tourism Programme. Designed in cooperation with the Global Sustainable Tourism Council (GSTC), this initiative encourages T&T accommodation facilities, travel agencies, tour operators and destinations to obtain Sustainable Tourism Verification and Certification, which covers internationally recognized standards for sustainable tourism set by the GSTC. Under the scheme's multistage rollout, all accommodation facilities in Türkiye are expected to have obtained First Stage Sustainable Tourism Verification, meaning they will comply with 30% of determined standards, by the end of 2023. The second stage should be complete in 2025, with accommodation venues meeting 70% of standards and finally 100% of standards being met by facilities by the end of the third stage in 2030. As a result of this rollout, it is expected that all of Türkiye's approximately 22,000 accommodation facilities will monitor, measure, improve and manage their sustainability performance, with the data provided integrated into dashboards that will enable policy-makers, investors and businesses to monitor and benchmark sustainability performance.<sup>24</sup>



3

# Using big data to address T&T sustainability challenges

Big data can play an integral role in tackling Türkiye's T&T sustainability challenges, creating a more competitive and resilient sector.





### 3.1 Big data in the context of sustainable T&T

The growing use of digital platforms and services in T&T and beyond has created a massive pool of useful data and tools for measuring and managing T&T sustainability, increasing their role in shaping sustainable tourism policies and practices. People and businesses leave traces of data behind in their transactions, movements, enquiries and other digital interactions. Therefore, with an increasing share of T&T and related services being accessed digitally via OTAs and sharing-economy platforms,

direct online bookings, digital payment systems and mobile devices, the amount of relevant T&T data has greatly expanded.<sup>25</sup> Some of the data generated is big data, which refers to the “large, diverse, structured and unstructured datasets of information that organizations, people, and machines (sensors) constantly generate and transmit at ever-increasing rates”.<sup>26</sup> Table 1 shows the large variety of relevant data types and sources within and beyond the T&T sector.

TABLE 1 Big data source and types

	Big data type	Data captured
Non-T&T-specific	Telecommunications	Calls, mobile data, geotagging
	Financial services and credit card	Transaction amounts, transaction locations, transaction types (products), user IDs, volume of transactions
	Retail	Products purchased, volume of transactions, location of purchases
	Smart-city sensors	Car parking, noise monitoring, water usage, traffic surveillance, facial recognition, electricity use, air-pollution reporting
	Climate change	Air quality, carbon emissions, water pollution, deforestation, coastal or reef degradation
	Geospatial data	Locations, attributes, temporal information
	Health	Patient data, COVID-19 test timings, test results
	SuperApps	Communications, movements, food, social, financial, retail
T&T-specific	Suppliers	Inventory, loyalty programmes, bookings, user IDs, web analytics, on-platform searches
	Global distribution systems	Inventory, loyalty programmes, user IDs, on-platform searches
	Traditional travel agents	Inventory, loyalty programmes, web analytics, on-platform searches
	Travel metasearch and review sites	Inventory across suppliers, user IDs, web analytics, on-platform searches, on-platform advertising, travel reviews
	Search and social media marketing platforms	Inventory across suppliers, user IDs, web analytics, on-platform searches, on-platform advertising, travel reviews, non-travel-related searches, non-travel-related advertising, non-travel-related purchasing, non-travel-related reviews
	Operations software	Asset management, human resources, web analytics, reward schemes
	Business intelligence	Social media analysis, travel-review analysis
	Travel marketing platforms	Web analytics, user IDs

Source: Asian Development Bank and World Tourism Organization, *Big Data for Better Tourism Policy, Management, and Sustainable Recovery from COVID-19*

According to the Asian Development Bank (ADB) and UNWTO, the T&T sector can apply data from tourism and non-tourism sources to enable T&T stakeholders to better track and manage the social, economic and environmental impacts of T&T, complement more traditional data-collection efforts, manage tourism flows and target preferred source markets, thereby helping to create smart destinations.<sup>27</sup>

In general, there are several advantages and opportunities in using big data for T&T management and statistics. As indicated in Table 1, big data analytics allows the processing of large volumes of data from a diverse range of sources that would not be possible through traditional analytical and statistical approaches. As a result, entirely new insights and indicators can be developed that more precisely and closely track factors such as visitor behaviour, experience and impact. Moreover, unlike

traditional data sources that rely on surveys and individual declarations, big data can be collected and analysed in a timelier, if not real-time, manner and can be tagged according to time and place.<sup>28</sup> Using big data, destination managers can, for example, track the similarities and differences in purchasing, travel and booking behaviour of a sample traveller group across competing destinations or in different seasons of the year. Or anonymized geospatial data from mobile devices and smart sensors can be used to help destinations track and manage destination load capacity, visitor flows and human resources in real time, leading to more effective and responsive actions. Also, environmental data and long-term trends and variations in climate-change figures can help public authorities and destination managers create strategic plans and development programmes for destinations.<sup>29</sup>

## 3.2 Application of big data for sustainable T&T management

This section of the paper provides several examples of government- or academia-led applications of big data relevant to managing tourism in a more sustainable manner.



Tourism intelligence platforms for inclusive and targeted policies

**Buenos Aires**, Argentina, is one of the most visited cities in Latin America, with T&T contributing to almost 300,000 jobs in the city in 2019.<sup>30</sup> In 2017 the Buenos Aires City Tourism Board launched the Tourism Intelligence System (SIT) in collaboration with public authorities including the National Tourism Secretariat and private-sector players such as Amadeus to improve public- and private-sector tourism decision-making and management. The system uses big data techniques to collect and aggregate data from sources such as e-commerce platforms, social media posts, global distribution systems, flight bookings and tourists' mobile devices to generate dashboards and provide insights into factors such as tourism demand patterns and sentiment, visitor provenance and movement of tourists. Moreover, the processing and analysis of mass data is based on a methodology that guarantees privacy and confidentiality.<sup>31</sup> Using mobile-device tracking data and online reviews, policy-makers can track visitor behaviour and the quality standards of T&T services and products across the 161 zones of Buenos Aires, create target promotions based on neighbourhood offerings and visitor profiles and even recommend opening and closing times to shop owners based on the presence of tourists. SIT has already been used to help develop fiscal incentives for hotel investment by identifying necessary improvements in the supply of accommodation,<sup>32</sup> and by proposing that the San Telmo Fair, historically open only on Sundays, should open on Saturdays to attract national and international tourists.<sup>33</sup>

### Sustainability challenges addressed:

Inclusive development, destination capacity and demand-pressure management



Empowering T&T business decision-making and transformation

Managed by the **Singapore Tourism Board** (STB), the Singapore Tourism Analytics Network (Stan) is a data-analytics platform that provides visualization and data analytics for policy-makers, industry representatives and the public. Before the pandemic the STB stated that it has integrated more than 20,000 internal data domains and signing data-sharing agreements with large data providers such as Grab, Tencent and Expedia.<sup>34</sup> Using big data analytics, the STB can employ Stan to analyse and forecast variables such as source markets, visitor behaviour and spending. In particular, the STB has prioritized the network as a tool to help T&T businesses gain insights for better decision-making. In addition to tourism statistics and forecasts, registered users can access the Data Marketplace, a platform for users to share and make use of tourism-related data, and Sandbox, a co-creation space that allows users to create, refine and run advanced analytics models.<sup>35</sup> Lastly, the STB uses Stan to support and inform its Tourism Transformation Index (TXI), a business-transformation self-assessment tool for T&T companies that, among other things, enables the companies to benchmark themselves against their peers and measure enterprise transformation according to aspects such as data-driven decision-making and customer orientation.<sup>36</sup>

### Sustainability challenges addressed:

Inclusive development



### Developing new benchmarks for tracking and monitoring tourism impact

**Seville**, Spain, is a leader in applying big data and digital technology for tourism management, being named the 2023 European Capital of Smart Tourism by the European Commission.<sup>37</sup> To measure and monitor tourism sustainability, the city worked with private-sector partners Mabrian, Mastercard and Ético to use big data analytics and data from social media, OTAs, purchase transactions and other sources to develop new Tourism Sustainability Indices. These indices are scored relative to other destinations and measure the distribution of tourism spending, CO<sub>2</sub> tourism footprint, concentration of tourism offerings, visitor perceptions of tourism sustainability, tourism dependence on demand niches and segments, dependence on source markets and seasonality.<sup>38</sup> Using these metrics, the city has identified areas for improvement, including the need to increase the distribution of tourist spending in the local economy. Moreover, Seville has integrated this data into its Tourism Intelligence System, where it can be combined with other data to inform strategic planning and research.<sup>39</sup>

**Sustainability challenges addressed:**

Environmental sustainability, inclusive development, destination capacity and demand-pressure management



### Managing tourism flow for balanced urban spaces

**Amsterdam** is one of the most popular urban destinations in the world, but it has also made headlines for overcrowding and other nuisances caused by tourism. In response, authorities have launched the City in Balance programme, which includes policies and initiatives aimed at balancing liveability and hospitality factors, including testing big data projects. One such test is the Rijenradar (Live Lines) system. The system monitors museum queues, informing visitors via mobile applications about waiting times. The project findings showed that waiting times of about three hours caused half of users to adjust the timing of their visits.<sup>40</sup> The city also developed Druktebeeld, a map that provides users with real-time crowding and parking information, giving people information on how to adjust their travel plans to avoid crowds and informing municipality officials of where and when to implement crowd-management action. The data comes from various sources, including mobile devices, sensors and cameras from the Amsterdam Crowd Monitoring System (CMSA).<sup>41</sup>

**Sustainability challenges addressed:**

Destination capacity and demand-pressure management



### Addressing tourism seasonality in nature destinations

Tourism is an important driver of economic development for the **Thompson Okanagan Region** of British Columbia, Canada. However, tourism traffic was mostly limited to a 45-day period during the summer, making the sector highly seasonal. In response, in 2016 the Thompson Okanagan Tourism Association (TOTA) partnered with TELUS Insights to develop a big data pilot project to collect and monitor visitor traffic along the Kettle Valley Rail (KVR) Trail, part of the region's Rail Trail network, a popular cycling and hiking attraction. TELUS collected data from mobile-phone towers near the KVR Trail to determine visitor volumes, visit timing and weather impacts on their behaviour. Using big data analytics, TOTA learned that the KVR Trail attracted more than three times the number of visitors estimated by traditional data-collection techniques and that it was more popular in the autumn than the summer. This allowed the tourism agency to develop more focused marketing campaigns that increased tourist interaction with the KVR Trail's online content by 20%. Similar big data efforts in other local tourism attractions expanded the region's sector revenue period from 45 days to 120, helping to further develop the 90-plus communities that make up the Thompson Okanagan.<sup>42</sup>

**Sustainability challenges addressed:**

Environmental sustainability, inclusive development, destination capacity and demand-pressure management



### Monitoring and protecting natural resources from climate and human impacts

Natural attractions such as coral reefs are major drivers of tourism in destinations such as **Hawaii**, where the tourism sector brought in more than 10 million visitors who generated nearly \$18 billion in spending in 2019.<sup>43</sup> However, a minor change in environmental conditions or human interaction can lead to rapid degradation of reefs. As part of the Ocean Tipping Points project, a team of researchers synthesized data from a range of sources to create the most comprehensive database of fish and benthic species for the Hawaiian Islands, encompassing nearly 6,000 sites. This extensive dataset allowed them to define and map reef states across the entire archipelago. The data was then integrated with human-use and environmental data, enabling researchers to identify what drives changes in the state of reefs and quantify threshold levels of stressors that result in significant changes in the condition of reefs. Aside from the database, this big data-powered project seeks to provide deliverables such as early-warning indicators for reef ecosystems and assessments of the social, environmental and economic costs and benefits of different land- and ocean-management actions.<sup>44</sup>

**Sustainability challenge addressed:**

Environmental sustainability

4

# Improving Türkiye's readiness for using big data

Türkiye needs to continue to invest in its readiness for using big data in the T&T sector.

## 4.1 Current data efforts and landscape

As the previous section has shown, big data can be highly valuable for sustainable development within T&T. Türkiye's Tourism Master Plan sets the goal of establishing a National Tourism Data Network and a Tourism Information Portal to manage nationwide sustainable tourism policies. According to the plan, data from credit card transactions, GSM roaming, social media tracking and online tourism marketing channels, as well as accommodation facility sustainability data and transportation company data, will be gathered and processed in addition to traditional data collected by the Turkish Statistical Institute (TURKSTAT), the country's national statistics agency. With this data, various planning, marketing and management efforts can be conducted more accurately. One of the plan's aims is to add e-shopping malls, commercial establishments, restaurants, bars and cafes in tourism regions in Türkiye into the data system, and to get data from GSM operators with credit card systems.<sup>45</sup>

Furthermore, the portal lists responsible organizations and stakeholders at both the destination and national levels. Provincial tourism promotion and development councils are responsible for destination-level data, while, at the national level, the Ministry of Culture and Tourism, the Tourism Promotion and Development Agency (TGA) and other relevant agencies are charged with data gathering. TURKSTAT has responsibility for compiling and publishing national-level data.

Sustainability data collection efforts are reinforced by initiatives such as the Türkiye Sustainable Tourism Programme. The programme's sustainability data tracking is based around the Türkiye Sustainable Tourism Programme Data Management System. To report sustainability data, establishments must register with the web-based system and provide data such as water use, waste generation and management, energy consumption, renewable-energy use, carbon footprint or greenhouse gas (GHG) emissions.<sup>46</sup>



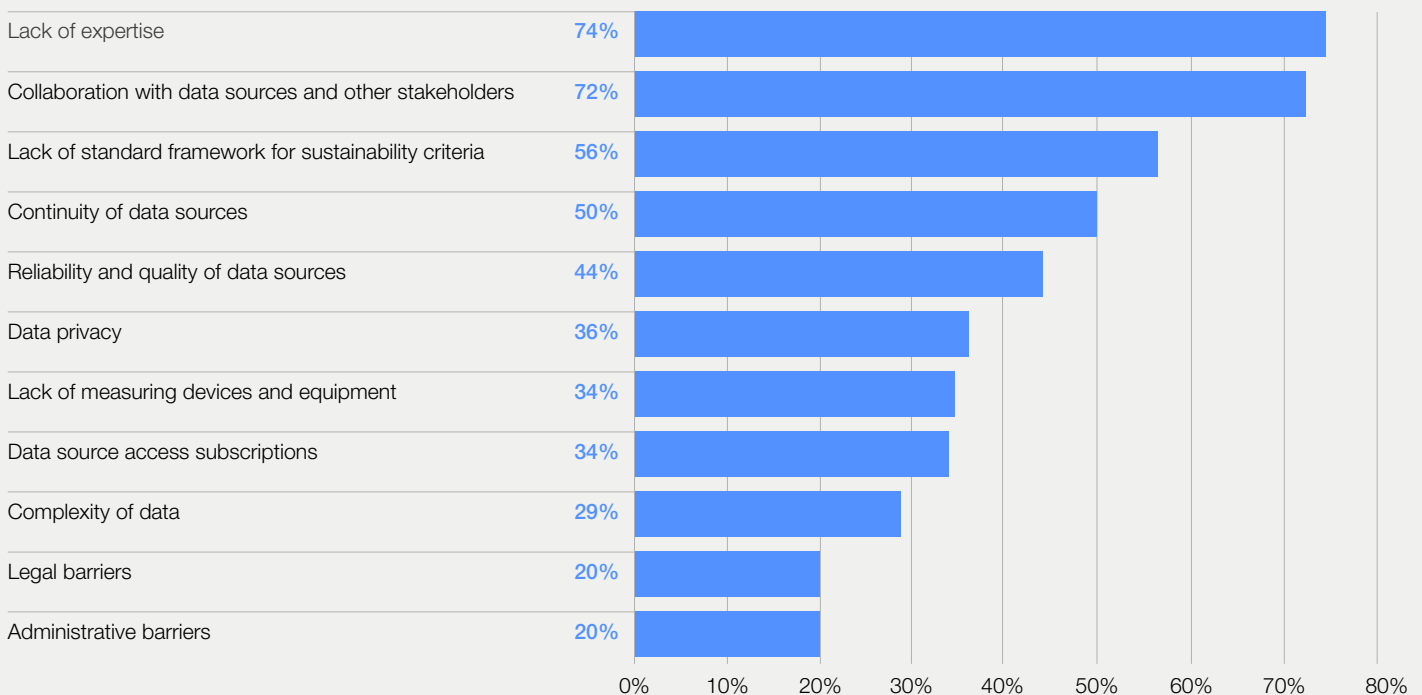
## 4.2 Türkiye's readiness and the challenges of using big data for sustainable T&T

As Türkiye continues to improve its local and national capacity to leverage big data analytics for T&T development, it is essential to assess any common and country-specific challenges in using big data.

According to the Destination Sustainability Survey conducted in coordination with the TGA and the Ministry of Culture and Tourism,<sup>47</sup> many sources of data are still not widely used by the relevant tourism authorities. For instance, only around

half of respondents had a positive perception of the use of online platforms and communications systems for data, and fewer than 25% were positive with regard to using sensors such as intelligent traffic systems and smart meters for data. The respondents also believed that the most urgent and significant challenges encountered in sustainability data collection are lack of expertise, collaboration with data sources and stakeholders, and a lack of standards for sustainability data (Figure 3).

FIGURE 3 Top challenges encountered in data collection.



**Note:** Respondents were asked to select the top five challenges encountered in data collection they considered most important in the context of big data sources.

**Source:** Destination Sustainability Survey conducted in coordination with the Tourism Promotion and Development Agency and the Republic of Türkiye Ministry of Culture and Tourism

For the most part, these findings align with some of the most common obstacles in the use of big data, thereby helping to identify the key readiness dimensions on which Turkish policy-makers need to focus.

### ICT and digitalization readiness

Access to quality ICT infrastructure is crucial for using big data effectively in tourism management. According to the 2021 TTDI, Türkiye ranks 52nd in ICT readiness, slightly below its Mediterranean

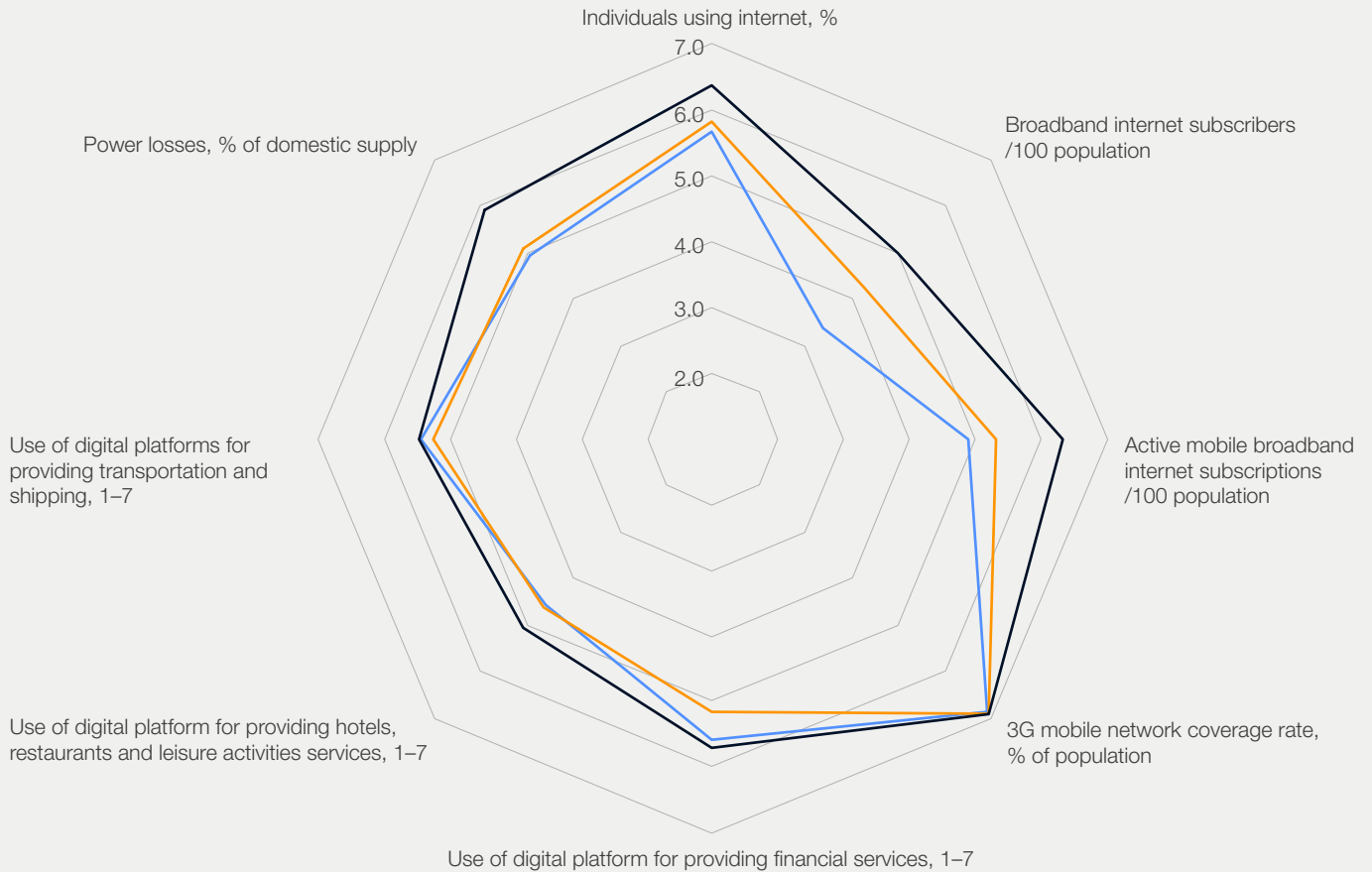
peers, and lags behind its high-income peers France, Italy and Spain in areas such as per capita broadband internet subscribers and active mobile broadband internet superscriptions. Closing Türkiye's digital divide, which encompasses demographic, economic and social inequalities in ICT access, is also vital. A recent study reveals significant gaps in access to devices, the internet and technology use based on income, education, gender, employment and region. For instance, in 2020 there was nearly a 20% gap between high-income and low-income individuals in internet access.<sup>48</sup>

This divide extends to MSMEs, which comprise most T&T firms. For example, only 25% of small Turkish firms have broadband speeds of at least 100 Mbps, 9.2% use e-commerce and 11.2% use cloud computing, all well below the Organisation for

Economic Co-operation and Development (OECD) medium.<sup>49</sup> The MSMEs' limited digital readiness hinders their ability to benefit from digitalization and engagement in public-sector big data initiatives, market competition and data contribution.<sup>50</sup>

FIGURE 4 Türkiye's 2021 TTDI ICT Readiness pillar indicator performance

● Türkiye ● Mediterranean peers ● High-income economies



**Note:** All figures are normalized on a scale of 1 to 7. More information on the Travel & Tourism Development Index and income-group classification can be found at <https://www.weforum.org/reports/travel-and-tourism-development-index-2021#report-nav>. Mediterranean peer economies are Albania, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Montenegro, Morocco, Portugal, Slovenia, Spain, Tunisia and Türkiye.

**Source:** World Economic Forum

### Human capital and skills readiness

Successful use of big data requires Turkish investment in human capital and technical expertise. Proficiency in data science, database management, visualization, programming, machine learning, law and business analysis are crucial.<sup>51</sup> Türkiye's Human Resources and Labour Market TTDI pillar ranking has climbed (from 64th in 2019 to 56th in 2021), indicating progress in building a qualified labour force. In particular, perceptions of the ease of finding skilled employees in the local labour market improved (from 97th in 2019 to 46th in 2021). However, further investment in digital skills is needed. In 2019, only 42% of Türkiye's

population possessed basic digital skills, while just 3.2% demonstrated advanced capabilities such as programming. Comparatively, this skill is more prevalent in Mediterranean peers such as Morocco (9.5%), Croatia (8.6%), Egypt (7.9%), Spain (6.8%) and Greece (4.1%).<sup>52</sup> Consequently, competition for ICT professionals among T&T authorities and private firms remains fierce.

### Stakeholder collaboration and sustainability frameworks

Using big data for T&T development presents multifaceted challenges rooted in the need for extensive stakeholder collaboration. The diverse

sources of data within and beyond the sector demand complex navigation, coordination and negotiation, both with private entities and external parties. Commercial agreements become intricate, particularly for smaller entities negotiating with powerful digital platforms. Integration into data systems may lead to structural dependence and hinder the switching of suppliers due to comparability and cost issues. Private players' reluctance to share proprietary data can further impede collaboration.<sup>53</sup>

Collaboration also extends to establishing sustainability standards. The absence of consistent criteria for measuring T&T's economic, social and environmental sustainability necessitates cooperation across Türkiye and globally. Initiatives such as the UNWTO's Measuring the Sustainability of Tourism (MST) programme, supported by the United Nations Statistics Division, work towards creating a universal framework.<sup>54</sup> Türkiye is collaborating with international bodies such as the GSTC to address this challenge, striving to establish recognized sustainability benchmarks. In essence, to use big data in T&T effectively will require overcoming collaboration challenges, fostering alignment across stakeholders and creating standardized sustainability metrics.

#### Limitations of big data

Turkish policy-makers seeking to use big data in tourism must also navigate inherent technical limitations. Understanding these limitations is essential for maximizing the value of big data while ensuring accurate and meaningful insights for informed decision-making in the tourism sector. Often collected for other purposes, big data's alignment with T&T sustainability objectives must be assessed and tailored. Another limitation is selectivity bias. While more traditional tourism statistics use various methods to reduce selection bias and help ensure the results are representative of the population, big data is collected from sources

that do not necessarily account for this. As seen in Türkiye's case with MSMEs and underprivileged groups, certain populations and segments with a more limited digital footprint may be excluded from data coverage. As a result, big data analysis may be less representative of conditions and subsequent policies may ignore groups with lower digital footprints. Rural areas with limited ICT infrastructure may also face limited data coverage and may struggle to apply and benefit from big data techniques and tools. Data continuity poses a challenge, as introducing big data disrupts stable frameworks used for traditional statistics, hindering, for instance, trend tracking. The differences in data collected before and after using big data can be so extreme that they become incomparable.<sup>55</sup> Reliance on varied sources raises data-quality issues, from oversight to guaranteeing alignment with official statistics standards.<sup>56</sup>

#### Data privacy

Privacy poses a significant concern in managing and analysing big data. Even when they are anonymized using traditional methods, such as concealing personal attributes, big data sets can still have the potential to reveal personally identifiable information. Governments and corporations are bound by law to adhere to international standards and best practices to safeguard data owners. Data-protection regulations become stricter as data volume, storage duration and types expand. In 1995 the European Union introduced the General Data Privacy Regulation (GDPR), updated in 2016, while Türkiye enacted its Personal Data Protection Law the same year. The distributed nature of big data across various devices and clouds globally challenges conventional data-protection solutions, falling short of the highest standards. With advancing data technologies, methods for safeguarding big data at the generation, storage and processing stages will evolve rapidly.<sup>57</sup>

## 4.3 Recommendations

Turkish authorities and other stakeholders can take several steps to further enhance the use and benefits of big data for sustainable, inclusive and resilient T&T growth.

#### Align T&T sustainability policy and challenges with big data opportunities and ecosystem capacity:

- Ensure that local and national T&T development strategies such as the Tourism Master Plan include environmental, social and economic sustainability objectives and community needs, with measurable targets.

- Review said strategies and plans to identify the areas in which big data can prove most useful. This can complement traditional statistics programmes.
- Audit and assess the current T&T big data ecosystem to determine its capacity to meet the needs of T&T development and sustainability strategies. This includes identifying any shortcomings in data collection and sourcing and addressing the challenges faced by ecosystem participants in areas such as institutional coordination, technical proficiency, ICT infrastructure, human resource development and funding capacity.

**Develop governance frameworks, funding and institutional capacity:**

- Work collaboratively with various stakeholders, including in the public sector, business and academia, to develop frameworks, best practices and tools for big data sourcing, management, analysis and application for sustainable tourism.
- Align statistical and sustainability frameworks with international standards such as UNWTO's Measuring the Sustainability of Tourism and GSTC criteria.
- Assign specific institutions, such as provincial tourism promotion and development councils, with the responsibility and resources for big data gathering and monitoring.
- Integrate and coordinate insights, resources and data with T&T-relevant national and local government agencies through working groups, forums and other mechanisms.
- Develop national and local tourism intelligence platforms where non-commercial and anonymized tourism data and analysis can be published for use by authorities, businesses and the general public.
- Create incentives to encourage private-sector data sharing, ensuring quality and privacy.
- Allocate adequate budgets or establish funding mechanisms similar to that of the TGA to support sustainable tourism-related big data management.
- Engage with international organizations to share insights and participate in global programmes such as UNWTO's International Network of Sustainable Tourism (INSTO) or the EU's European Tourism Indicators System.

**Invest in human resource capacity:**

- Develop big data skills by investing in training programmes for the public and private sectors to impart skills in data science, machine learning, data law, business analysis, etc.
- Provide continuing education opportunities and integrate big data curricula at universities.
- Create incentives to retain skilled labour in the public sector, including reskilling programmes, higher wages and promotional opportunities linked to big data qualifications.

- Expand the overall skilled labour pool by ensuring that education and training are accessible to all and working with stakeholders to create widely recognized big data-related certifications.

**Encourage digitalization and ICT investment:**

- Invest in digital infrastructure such as sensors, networks and data centres to support the widespread collection and processing of tourism data such as pedestrian traffic.
- Continue to invest in basic ICT infrastructure and access among the general population, MSMEs and rural and secondary destinations in order to increase their digital footprint and enable them to take advantage of the benefits of digitalization.
- Assist small and micro enterprises in particular in accessing digital benefits, including promotions, payment systems and supply chains.

**Ensure data privacy and security:**

- Establish national and secure cloud services to protect valuable data.
- Work with academia and professionals to create secure databases and implement tools such as encryption and firewalls.
- Establish guidelines and regulations to protect personal data and conduct privacy assessments.
- Implement technical tools and methods to protect personal data. This can include encryption, firewalls and other security measures.
- Conduct privacy impact assessments before collecting, storing or sharing personal and business data.
- Draft and sign data-sharing agreements that specify how data is to be used, shared and protected. These agreements should be prepared in consultation with stakeholders, including businesses and public-sector actors.
- Provide education and training programmes focused on promoting privacy protection.



5

# Conclusion

As Türkiye's T&T sector rebounds from the effects of COVID-19, using big data will help drive the nation towards a sustainable future in tourism.

The recovery of Türkiye's T&T sector from COVID-19 and its vital role in the economy underscore the need for sustainable development. The country's policy-makers have recognized this in the 2028 Tourism Master Plan and initiatives such as the Türkiye Sustainable Tourism Programme. Big data provides new solutions for measuring and monitoring the economic, social and environmental impacts of T&T, helping inform policies and maximize the potential of the sector to generate prosperity for the country. However, realizing this potential requires

greater focus and investment in areas such as ICT infrastructure, skills, frameworks and data privacy. Moreover, the complex and fragmented nature of tourism and the data ecosystem's diversity require continuous multistakeholder collaboration. Policy-makers must work with multiple agencies, businesses, international organizations, academia and local communities to create and align T&T sustainability strategies and efforts to harness big data's full potential.



# Contributors

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