Tourism futures dynamics theory: towards a theoretical foundation for futures studies in tourism

Stephan Bingemer

Stephan Bingemer is based at the Institute of Tourism, Travel and Hospitality, Heilbronn University of Applied Sciences, Heilbronn, Germany.

Abstract

Purpose – *Tourism futures studies are of increasing interest. However, they remain method-driven and fragmented, with little theoretical consolidation. This article develops the Tourism Futures Dynamics Theory (TFDT), a mesotheory that brings together foundational constructs from futures studies and tourism management.*

Design/methodology/approach – *This is a conceptual theory-building article. We review and select constructs from the parent disciplines tourism futures and tourism management based on their necessity, relevance and transferability. These are integrated into a coherent relational model, with entropy introduced as a novel construct in tourism futures to capture the tendency of tourism futures scenarios to decay unless sustained by energy input. From this model, theoretical propositions are derived to guide further research.*

Findings – *We identified five foundational constructs (time, space, agency, uncertainty and entropy) that collectively form the building blocks of tourism futures. TFDT positions entropy as the dynamic force that destabilizes scenarios unless countered by deliberate action. Scenarios emerge from the interaction of temporal perspectives (past, present and future), spatial contexts (physical and virtual) and agency (protagonists and antagonists), but require continuous energy to persist.*

Originality/value – *This study makes three main contributions to the literature. First, it identifies and justifies a set of foundational constructs for tourism futures studies. Second, it integrates these constructs into TFDT, the first explicit theoretical foundation of the field. Third, it introduces entropy as a novel construct in tourism futures that explains scenario instability and the energy required to sustain desired futures.*

Keywords *Tourism futures dynamics theory, TFDT, Scenario planning, Dynamics, Theory development, Entropy reduction*

Paper type *Conceptual paper*

1. Introduction

Tourism is one of the sectors most exposed to uncertainty (Martínez-Roget *et al.*, 2024; Pappas *et al.*, 2023; Valadkhani, 2024). Global crises such as pandemics (Gössling *et al.*, 2021; Koçak *et al.*, 2023), natural disasters (Rosselló *et al.*, 2020), climate change (Gössling and Hall, 2006), economic uncertainty (Kuok *et al.*, 2023), geopolitical instability (Lee *et al.*, 2021) and technological disruption (Williams *et al.*, 2021) show the vulnerability of tourism to shocks. Simultaneously, tourism adapts quickly to new consumer trends (Cohen *et al.*, 2014), technological opportunities (Buhalis and Law, 2008; Navío-Marco *et al.*, 2018) and social expectations (Font and Lynes, 2018). These characteristics make tourism an ideal area for futures research. In recent years, futures studies have attracted attention in tourism, supported by methods such as scenario planning, Delphi surveys, horizon scanning, trend analysis and backcasting (Postma *et al.*, 2024; Yeoman and McMahon-Beattie, 2025).

The ample body of literature, together with dedicated outlets such as the *Journal of Tourism Futures*, indicates that the field is consolidating. Despite these achievements, tourism futures

Received 16 September 2025
Revised 12 November 2025
Accepted 4 December 2025

research still is largely method-driven and fragmented and needs theoretical contributions (Postma *et al*., 2017a; Seyitoğlu and Costa, 2024). Many studies continue to make use of instruments from futures studies, but these are only partly adjusted to the socio-cultural, spatial and economic conditions that shape tourism. The consequence is that quite a few contributions remain on a descriptive level, offering scenarios of interest while lacking a stronger theoretical foundation.

One particular limitation is the treatment of dynamics. Much scenario work still views the future as a collection of static outcomes (plausible, possible or preferable end-states) rather than evolving configurations. These approaches struggle to explain why some scenarios endure while others fade, or why sustaining preferred futures demands ongoing effort. In practice, scenarios often lose relevance as conditions change, stakeholders withdraw or disruptive events intervene. Yeoman and McMahon-Beattie (2025) have therefore argued for stronger theory development in the field. Unlike history, the future cannot be studied through direct data collection or subjected to Popper's principle of falsification (Popper, 1959). This epistemological challenge has led some to dismiss futures research as being purely speculative. However, futures studies have developed a rich conceptual vocabulary (i.e. time horizons, multiple futures, uncertainty and path dependency) that can be systematized for tourism. A theory of tourism futures does not forecast a single outcome. Instead, it explains how constructs interact to produce different scenarios, why certain patterns emerge and under what conditions they are reinforced or undermined.

To address this gap, the present study proposes the Tourism Futures Dynamics Theory (TFDT), a mesotheory (i.e. a theoretical framework operating between actor-based micro theories and systemic macro theories) that conceptualizes tourism futures as dynamic systems structured by five core constructs: *time, space, agency, uncertainty* and *entropy*. Time links knowledge of the past with decisions in the present and expectations about the future. Space refers to both physical and virtual contexts, from destinations to digital realms such as the metaverse. Agency emphasizes the role of protagonists and antagonists in advancing or resisting change. Uncertainty captures the irreducible openness of futures, which rules out prediction but makes scenario exploration valuable. Entropy, introduced here as a novel construct of tourism futures, captures the universal tendency of scenarios to drift towards "disorder" unless sustained by continuous energy and management efforts. Taken together, these constructs show why scenarios are not static snapshots but evolving processes that demand continuous attention.

In designing TFDT, we followed the recommendations on theory development in tourism research by Nunkoo and Armbrecht (2025), who listed *variable definition*, *domain where the theory is applied*, *variables relations* and *specific predictions* as the four constituting elements of theory.

We formulate the following three research questions:

RQ1. *(Foundations):* Are the constructs of time, space, agency, uncertainty and entropy both necessary and sufficient as a foundation for tourism futures studies?

RQ2. *(Mechanisms):* How do these foundational constructs *interact* to explain the emergence, persistence, and decay of tourism futures scenarios?

RQ3. *(Novelty):* How does the introduction of entropy improve explanation and scenario design in the study of tourism futures?

This study makes three contributions. First, it identifies and justifies a set of foundational constructs that define the conceptual landscape of tourism futures research. Second, it specifies how these constructs relate within a dynamic model, advancing a theory that explains how scenarios emerge, persist and dissolve. Third, it introduces entropy as a novel construct, adding explanatory power by showing the energy required to sustain preferred futures. Together, these contributions form the *Tourism Futures Dynamics Theory (TFDT)*, which offers the first explicit theoretical foundation for tourism futures studies and opens avenues for empirical testing and theoretical refinement.

2. Conceptual foundations of tourism futures studies

Tourism futures studies have emerged as a recognized research field over the past two decades (Yeoman and McMahon-Beattie, 2025). The growing number of scenario studies, establishment of specialized journals and increasing involvement of tourism policymakers and businesses in foresight activities all underline its relevance (Yeoman and McMahon-Beattie, 2025). This section outlines why tourism futures studies need a theoretical foundation, where current practice falls short and how an epistemological orientation can support theory building.

2.1 Why tourism needs futures theory

The usefulness of futures thinking has been widely demonstrated (Postma *et al.*, 2024; Yeoman and Postma, 2014; Yeoman and McMahon-Beattie, 2025). It has been applied in different contexts such as supporting the preparation for climate risks (Postma *et al.*, 2017b), anticipating technological adoption (Oskam and Boswijk, 2016) and supporting policy formulation (Yeoman *et al.*, 2022). Still, many contributions remain method-specific. They yield useful insights, but their findings are seldom integrated into a coherent framework. By comparison, related fields such as strategic foresight and innovation studies have developed stronger theoretical foundations, which have earned them broader recognition among scholars.

Tourism futures studies confront two challenges: they must prove relevant to practice while also satisfying academic standards of rigor. Without theory, the field risks being seen as an applied toolbox rather than a legitimate scholarly domain. Theory offers exactly what is missing (Nunkoo and Armbrecht, 2025). It provides shared constructs, defined relationships and propositions that explain how and why tourism futures evolve as they do.

2.2 The pitfalls of method-driven futures

Tourism futures research is dominated by scenario planning, horizon scanning, and trend analysis, which generate outputs accessible to decision-makers. Yet this method-centred focus has clear drawbacks: it leaves conceptual assumptions implicit, treats scenarios as static and struggles to address cross-cutting dynamics. Tourism futures are shaped simultaneously by time (short- vs. long-term horizons), space (destinations, networks, virtual realms), agency (stakeholder interests and governance) and uncertainty. However, individual methods often privilege one construct over others. For example, forecasting and trend analysis emphasize time horizons (Armstrong, 2001), spatial modelling approaches focus on destinations and networks (Baggio, 2008), participatory backcasting highlights stakeholder agency (Robinson, 1990) and causal layered analysis puts deep uncertainty and meaning structures in the spotlight (Inayatullah, 1998).

Many methods emphasize one dimension while neglecting integration. These limits highlight the need to shift the focus from methods as the core of tourism futures research towards constructs and relationships that explain dynamics across methods.

2.3 Ontological and epistemological challenges

Developing theory about the future is inherently difficult. Unlike the past, it cannot be observed directly, and long-term claims cannot be falsified, which undermines strict positivism. Post-positivism as formulated by Guba and Lincoln (1994), relaxes the idea of absolute objectivity by allowing probabilistic claims, which makes it suitable for near-term forecasting. Constructivist and interpretivist approaches (Schwandt, 1994) emphasize that imagined futures emerge from collective narratives, values, and expectations rather than from data alone. Critical perspectives (Inayatullah, 1998) extend this reasoning by revealing power structures that define which visions of the future become legitimate or dominant. At a deeper ontological level, a realist position (Bhaskar, 1975) explains how causal mechanisms and material constraints shape what can

plausibly occur, while a constructivist ontology highlights meaning-making and participation in scenario building. Taken together, these perspectives suggest that tourism futures require philosophical pluralism. Short-term forecasting may align with post-positivism, but long-term pathways demand constructivist or critical insights. In practice, both perspectives often coexist. For instance, climate-related scenarios combine realist assumptions about biophysical constraints with constructivist analyses of governance, behaviour, and distributional effects. TFDT therefore embeds methodological pluralism as a necessary foundation of understanding the dynamic and multi-layered nature of futures in tourism.

3. Constructs of tourism futures dynamics

Moving towards theory building requires identifying foundational constructs that are broad enough to capture the essence of futures studies, yet precise enough to guide tourism research. Theory building also requires parsimony. Constructs should be clearly defined, distinct from each other and sufficient as a set to explain the phenomenon of interest (Whetten, 1989). Futures studies have developed a wide range of concepts such as time horizons (Brier, 2005; Hines *et al.*, 2024), multiple futures (Gall *et al.*, 2022; Slaughter, 2020), uncertainty (Cordova-Pozo and Rouwette, 2023), resilience (Sircar *et al.*, 2013), complexity (Derbyshire, 2016; Presti, 1996), path dependency (Järvensivu *et al.*, 2021), anticipation (Granjou *et al.*, 2017; Poli, 2014) and visioning (Bell, 2005; Nerland *et al.*, 2024), among others. Tourism research adds further notions, such as destinations, networks, visitor experiences and industry structures (Buhalis, 2000; Scott *et al.*, 2008). While all of these are meaningful, not all are equally useful in establishing a theoretical foundation for tourism futures.

The purpose here is not to compile an exhaustive catalogue of concepts but to identify a set of constructs that are both *necessary and sufficient* for building theory (MacKenzie *et al.*, 2011). Five constructs met these criteria: *time, space, agency, uncertainty* and *entropy*. These were selected for three reasons. First, they are necessary, because each addresses one dimension of tourism futures that cannot be reduced to another. Time captures temporal orientation, space provides the contextual environment, agency highlights the role of actors, uncertainty reflects the openness of outcomes and entropy introduces a dynamic tendency towards disorder and decay. Second, they are *sufficient*, because together they span the essential dimensions required to explain how tourism futures emerge, persist or decline. Adding further constructs risks redundancy rather than explanatory gain. Third, they were *transferable*. Each construct originates in futures studies or related fields, yet can be meaningfully applied in the tourism context.

This selection does not deny the value of other concepts in futures research. Rather, it proposes that time, space, agency, uncertainty and entropy provide the minimal but sufficient building blocks of TFDT. Table 1 outlines these five constructs along with their definitions, disciplinary origins and relevance for tourism futures research.

3.1 Time

Time is a central construct in futures studies and also one of the most contested (Brier, 2005; Nordlund, 2012). Western traditions emphasize linear progression, while Eastern traditions emphasize circular recurrence (Lichty, 2023; Nordlund, 2012). Tourism reflects both: linearity influences planning horizons, whereas cyclicality appears in seasonality, generational shifts and recurring crises. Beyond these cultural constructions lies subjective time (Fowles, 1974). Subjective time refers to the way individuals and groups perceive "nowness" (Pöppel, 2009) and connect it with memories and expectations. In tourism futures, time structures how scenarios are conceived, whether through short-term forecasting or long-term horizon scanning. Acknowledging both linear and circular notions of time enriches scenario design and helps make underlying biases explicit.

Table 1 Foundational constructs of TFDT

Construct	*References*	*Definition*	*Source Discipline(s)*	*Relevance for tourism futures*
Time	Brier (2005), Fowles (1974), Lichty (2023), Nordlund (2012), Pöppel (2009)	Temporal orientation of past, present, and future; includes linear, cyclical and subjective perspectives	Futures studies, philosophy, cultural studies, physics	Shapes how tourism scenarios are constructed (planning horizons, memories, seasonality, long-term strategies)
Space	Buhalis *et al.* (2023), Córdoba Azcárate (2025), Dhami *et al.* (2022), Filimonau *et al.* (2024), Leiper (1990), Prideaux (2000), Rosselló *et al.* (2020), Schroeder (1993)	The physical and virtual environments within which tourism occurs	Geography, digital studies, physics	Destinations, attractions, networks, mobility systems and virtual spaces (e.g. metaverse)
Agency	Brassett (2021), Granjou *et al.* (2017), Hall (2011), Lee *et al.*(2010), Jamal and Getz (1995), Milano *et al.* (2024), Roxas *et al.* (2020)	The capacity of actors to shape futures; distinguished as protagonists (supportive) and antagonists (oppositional)	Sociology, management, political science	Stakeholders such as governments, businesses, NGOs and communities influence which futures become plausible
Uncertainty	Bevan (2022), Buhalis and Law (2008), Koçak *et al.* (2023), Lee *et al.* (2021), Navío-Marco *et al.* (2018), Rosselló *et al.* (2020), Scott *et al.* (2019)	The degree to which outcomes are indeterminate, unpredictable or probabilistic	Futures studies, decision theory	Shocks (e.g. pandemics), risks (e.g. climate) and surprises (e.g. disruptive technologies) frame the plausibility of scenarios
Entropy	Floyd (2007), Funtowicz and Ravetz (1997), Li *et al.* (2025), Shannon (1948), Wehrl (1978)	The universal tendency of systems towards "disorder" unless sustained by energy input	Thermodynamics, information theory	Explains why scenarios decay, why energy and management effort are required to sustain tourism futures

Although contemporary physics treats time and space as co-constituted (spacetime), tourism analysis benefits from an analytical separation.

3.2 Space

Space refers to the contexts within which tourism futures unfold (see the space/place tradition in tourism geographies). In geography, space is physical and bounded; in modern futures research, it includes virtual and augmented environments (Córdoba Azcárate, 2025; Schroeder, 1993). For tourism, space encompasses destinations, attractions, landscapes and the infrastructure that connects them (Leiper, 1990; Prideaux, 2000). Digitalization also includes platforms, virtual realities and metaverse (Buhalis *et al.*, 2023; Filimonau *et al.*, 2024). Futures scenarios must therefore account not only for physical places but also for digital spaces where tourism experiences are created and consumed (Dhami *et al.*, 2022; Filimonau *et al.*, 2024). Space is also

linked to external shocks such as natural disasters, which alter scenario plausibility (Rosselló *et al.*, 2020).

Taken together, time and space provide the ontological foundation of futures. In TFDT, each scenario is understood as a specific space-time configuration. It is anchored in a concrete environment, such as a destination, a region or even a virtual realm, and situated on a temporal horizon, whether short-, medium- or long-term. This view highlights the dual nature of tourism as both spatially and temporally embedded.

3.3 Agency

Agency highlights the role of actors in shaping tourism futures (Granjou *et al.*, 2017). Borrowing from sociology and management, TFDT distinguishes between protagonists who actively support and co-create futures (Brassett, 2021; Jamal and Getz, 1995) and antagonists who resist, block, or destabilize futures (Milano *et al.*, 2024). In tourism, protagonists may include destination managers, businesses, or activist groups advocating sustainable practices (Milano *et al.*, 2024; Roxas *et al.*, 2020). Antagonists may be opposing stakeholder groups, regulatory inertia or competing interests (Hall, 2011; Lee *et al.*, 2010). Agency highlights that tourism futures are shaped not only by external trends but also by the strategic actions (or inactions) of stakeholders (Brassett, 2021; Jamal and Getz, 1995).

3.4 Uncertainty

Uncertainty is an inherent feature of futures research. Unlike risk, which is probabilistic, uncertainty refers to an irreducible openness of outcomes (Bevan, 2022). In tourism, it manifests in sudden shocks (e.g. pandemics, disasters, geopolitical crises), slow-burn risks (such as climate change) and disruptive surprises (new technologies, shifting consumer preferences).

Disasters depress arrivals (Rosselló *et al.*, 2020), geopolitical risk lowers demand (Lee *et al.*, 2021), pandemic uncertainty reduces visits (Koçak *et al.*, 2023), while climate change produces structural vulnerability (Scott *et al.*, 2019) and digital disruption/consumer shifts reconfigure markets (Buhalis and Law, 2008; Navío-Marco *et al.*, 2018).

Scenarios structure uncertainty by articulating alternative pathways and testing their plausibility (Dhami *et al.*, 2022). In TFDT, uncertainty is not “noise” but a constitutive condition implying the need for resilience (absorb shocks) and adaptability (respond to surprises) in destinations and firms.

3.5 Entropy

Entropy has been proposed as a novel construct for tourism futures studies. Drawing on thermodynamics (Wehrl, 1978) and information theory (Shannon, 1948), it describes the tendency of systems towards “disorder” unless energy is invested to maintain order (Floyd, 2007; Funtowicz and Ravetz, 1997). A recent study by Li *et al.* (2025) confirms that entropy increase is a key dynamic in tourism and that entropy reduction represents a central purpose of tourism.

In tourism, entropy explains why scenarios deteriorate over time (i.e. destinations lose strategic coherence, stakeholder coalitions fragment and visitor flows become unmanaged) unless continuous governance energy is invested (Baggio *et al.*, 2010; Beritelli, 2011; Leiper, 1993). Conceptually, this aligns with socio-technical “maintenance” work that keeps organizations coherent under change. Empirically, entropy can be proxied by measurable drift in networks, participation and demand patterns (Andria *et al.*, 2019; Zhang *et al.*, 2011). High-entropy futures indicate unmanaged drift, whereas low-entropy futures reflect intentional energy-intensive management (Baggio *et al.*, 2010; Beritelli, 2011; Floyd, 2007; Funtowicz and Ravetz, 1997).

The inclusion of entropy highlights the dynamic instability of scenarios and the energy costs of sustaining desired futures. Entropy is sometimes referred to as a state of "disorder". We place "disorder" in quotation marks because entropy formally measures the multiplicity rather than the order of the microstates. High entropy can co-exist with visible order when energy throughput maintains structure; thus, equating entropy with obvious disorder can be misleading (Floyd, 2007; Funtowicz and Ravetz, 1997; Jaynes, 1957; Shannon, 1948).

While entropy is presented here as a conceptual construct, it can also be operationalized in empirical research. Indicators might include stakeholder disengagement, fragmentation of coalitions, declining visitor flows or loss of institutional memory.

4. The tourism futures dynamics theory (TFDT)

After identifying time, space, agency, uncertainty and entropy as foundational constructs, the next step is to specify how they interact within a coherent framework. TFDT explains why scenarios emerge, why they are inherently unstable and why deliberate effort is required to sustain them.

4.1 Assumptions of TFDT

The development of TFDT rests on several foundational assumptions that set it apart from method-driven approaches. First, it assumes that futures are socially constructed. Scenarios are not uncovered as objective truths about what will inevitably occur but are created through imagination, negotiation and stakeholder representation. This premise aligns TFDT with constructivist perspectives that emphasize narratives and collective sense-making (van der Heijden, 2005; Wright and Goodwin, 2009). A second assumption is that dynamics matter: futures are processes that unfold across time horizons in response to changing conditions, actor interventions and systemic feedback. Third, TFDT assumes that all futures are prone to drift, fragmentation and decay unless energy is continuously invested to stabilize them. Fourth, TFDT assumes that constructs are relational. Time, space, agency, uncertainty and entropy must be understood as an interdependent system in which each shapes the others. Finally, TFDT advocates pluralism. Because the future cannot be falsified, no method is inherently superior and both quantitative and qualitative approaches are valid when their assumptions are clearly stated.

4.2 Dynamics between constructs

The explanatory strength of TFDT does not stem from the five constructs taken separately but from their dynamic interaction. Time and space provide the ontological foundation. Each scenario represents a particular configuration situated in a spatial environment (i.e. physical or virtual) and projected onto a temporal horizon, whether short-, medium- or long-term. At this stage, entropy introduces systemic instability. If scenarios are left unattended, they gradually deteriorate as coordination weakens, resources diminish and coalitions fragment. Entropy therefore functions as a universal force of drift that constantly threatens the persistence of futures. Its epistemic consequence is uncertainty. As disorder increases, outcomes become less predictable, and the plausibility, impact and direction of futures become harder to determine. In this way, uncertainty widens the range of possible futures, forcing actors to confront competing scenarios rather than a single trajectory.

Agency enters this relational system as the human response to uncertainty. Actors (such as policymakers, businesses, communities or activist groups) interpret uncertainty and mobilize strategies to stabilize preferred futures, resist undesired ones or seize opportunities for change. Within TFDT, agency is divided into protagonists and antagonists. Protagonists invest energy to promote and sustain certain scenarios, while antagonists resist or destabilize them. Implementation is the mechanism that makes agency consequential. Without being translated into concrete action, narratives remain rhetorical and entropy gradually erodes them.

Implementation therefore provides a critical energy input that counters entropy, sustains coherence and enables futures to persist.

These relationships form a causal chain: entropy produces uncertainty, uncertainty conditions agency and agency, through implementation, counteracts entropy to stabilize or realize scenarios.

4.3 Relational model

Figure 1 shows TFDT as a relational system. At *now*, the real space-time configuration represents the current state of tourism. Entropy drives "disorder" and produces rising uncertainty, which defines the scope of scenarios in terms of plausibility, impact and unpredictability. Uncertainty forces agency to respond. Through implementation, energy is invested to stabilize or realize specific scenarios. The outcome is a set of alternative space-time configurations representing possible futures. The model highlights that scenarios are dynamic processes shaped by continuous feedback between systemic tendencies and human agency rather than static end-states.

4.4 Theoretical propositions

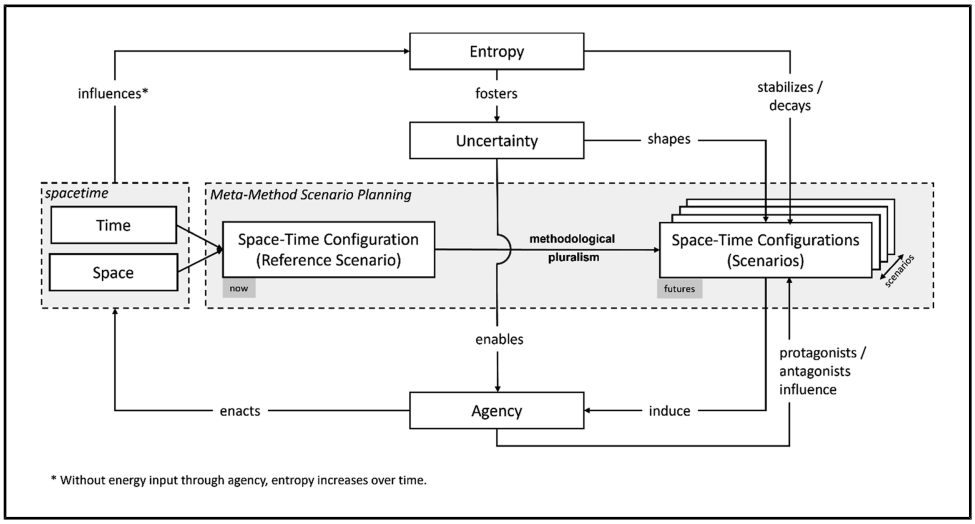
Based on this relational model, TFDT develops a set of propositions intended to guide both empirical inquiry and theoretical refinement.

Proposition 1. Tourism futures scenarios naturally move towards higher entropy unless actively counterbalanced by deliberate energy input.

Proposition 2. The balance between protagonists and antagonists determines the entropy path of a scenario. When protagonists dominate, scenarios can stabilize and endure; when antagonists prevail, they tend to decline more rapidly.

Proposition 3. Scenarios that integrate both retrospective learning from the past and anticipatory orientation towards the future are more robust than those anchored only in present assumptions, as they draw on a broader temporal repertoire.

Figure 1 Conceptual model of the tourism futures dynamics theory (TFDT)



Proposition 4. The interaction of temporal horizons and spatial contexts shapes scenario plausibility. Futures anchored in concrete destinations, regions or virtual environments are more meaningful than abstract or universal visions.

Proposition 5. How uncertainty is framed influences scenario design and reception. Framing it as risk invites probabilistic methods, framing it as shock highlights resilience and framing it as surprise emphasizes adaptability and imagination.

These propositions take TFDT beyond description and towards explanation, providing a basis for systematic testing and refinement.

4.5 Scope and positioning

TFDT is a mesotheory developed for application at the level of tourism systems such as destinations, organizations and governance networks. Its main scope lies in contexts where tourism futures are shaped by identifiable actors, structured space-time configurations and observable entropy dynamics. It does not claim universal applicability across all social futures but offers explanatory leverage specifically for tourism systems exposed to volatility and uncertainty.

TFDT presents itself as a unifying framework in a fragmented field. For practitioners, it underlines that scenarios are not static products but processes requiring ongoing management. For researchers, it provides propositions that can be empirically tested, refined or falsified.

5. Meta-methods and methods in TFDT: linking theory and practice

Methods serve as a bridge between theoretical constructs and practical applications. In futures research generally, and in tourism futures studies in particular, the variety of available methods can appear fragmented and eclectic. In realist foresight traditions, methods such as forecasting and trend extrapolation are used to identify causal mechanisms and probabilistic trajectories of change (Armstrong, 2001; Makridakis *et al*., 2009). Constructivist approaches, by contrast, emphasize narrative and participatory scenario development, where meaning and shared imaginaries shape futures (Bishop *et al*., 2007; van der Heijden, 2005). Critical and interpretive traditions are captured by causal layered analysis (CLA), which explores surface issues, systemic causes, worldviews and myths underlying tourism futures (Inayatullah, 1998; Slaughter, 2002). Within TFDT, these methodological orientations correspond to the constructs of time and uncertainty (forecasting), agency and space (narrative participation) and entropy (critical reflexivity). This shows how epistemological pluralism becomes operational in empirical foresight design.

TFDT provides a way to integrate them within a coherent dynamic structure. Instead of treating all techniques as equal, TFDT distinguishes between meta-methods, which guide and structure the overall process, and methods that create specific space-time configurations (futures scenarios).

The two meta-methods that shape the overall process are *scenario planning* and *backcasting*. The scenario planning process begins with a reference frame that defines the baseline against which futures are imagined (Postma *et al.*, 2024). Once it is established, futures scenarios can be developed through scenario planning.

Scenario planning functions as the principal method within TFDT, but only when understood as a meta-method. Its role is to integrate diverse tools, approaches to scenario construction and epistemologies into a structured process for building futures. Scenario planning accommodates diverse methods such as realist forecasting, constructivist narrative methods and critical approaches such as causal layered analysis conceiving scenarios as space-time configurations shaped by agency, uncertainty and entropy. Its openness to methodological pluralism is a defining feature of the TFDT. Researchers can select methods not simply by preference but by their contribution to exploring or counteracting specific constructs. Constructing futures scenarios within the TFDT means designing space-time configurations that are plausible,

possible or desirable. TFDT does not privilege one approach over another but instead situates them within a coherent framework where each contributes to different constructs – *forecasting* to time and uncertainty, *Delphi* to agency, *simulation* to entropy and *narrative methods* to space and cultural meaning. In Table 2, we list a selection of possible methods clustered along the quadrants of Bergman *et al.* (2010) and show how they relate to TFDT. Backcasting is then used to determine how these static futures translate to critical turning points and decision-making in the nearer future and presence. Backcasting is a meta-method that determines the real-world impact and derives change impulses of crafted scenarios for the presence.

6. Discussion and conclusion

This final section consolidates the theoretical, methodological and practical contributions of the TFDT. It integrates the conceptual arguments developed throughout the article and reflects on their implications for research and tourism practice. The discussion begins by revisiting how TFDT unifies fragmented approaches in tourism futures research before elaborating on its epistemological, dynamic, normative, methodological and practical dimensions. It concludes by outlining limitations, research opportunities and the broader significance of TFDT.

6.1 Integrating the fragments of tourism futures research

TFDT responds to a long-standing critique of the field: its reliance on fragmented, method-driven approaches lacking theoretical coherence. While scenario planning, Delphi, trend analysis, horizon scanning and CLA have each produced valuable insights, they often isolate specific dimensions of the future rather than explaining how they interact. TFDT provides an unifying theoretical foundation that conceptualizes tourism futures as dynamic configurations shaped by the interdependence of the variables time, space, agency, uncertainty and entropy. The TFDT framework reframes futures not as static end-states but as evolving systems that require constant energy to sustain coherence. Using entropy, a borrowed construct from thermodynamics, the natural tendency towards "disorder" within tourism systems is captured. Without continuous investment of attention, governance and coordination, even well-designed scenarios decay. TFDT therefore explains not only how futures emerge but also why they drift, collapse or stabilize. Resilience becomes an outcome of agency counteracting entropy. Path dependency becomes a temporal mechanism embedded within systemic evolution and complexity arises from the interplay of uncertainty and entropy. By situating these dynamics at a meso-level between actor-based micro theories and systemic macro theories, TFDT achieves parsimony: a small set of constructs accounts for diverse phenomena previously treated in isolation. It complements and extends Baggio's (2008) complexity science by specifying how systems drift or stabilize through feedback between uncertainty and agency. Likewise, it deepens Dator's (2009) four futures archetypes by explaining why certain scenarios persist while others decay. TFDT thus advances tourism futures research from a descriptive to an explanatory stage.

6.2 Theoretical contributions and epistemological pluralism

The coherence of TFDT derives not only from its constructs but also from its philosophical foundation. Futures cannot be studied through a single lens because they involve both material constraints and imagined possibilities. TFDT therefore adopts an epistemological and ontological pluralism that accommodates different modes of knowing the future. Quantitative forecasting and probabilistic modelling reflect a post-positivist stance concerned with explanation and prediction, while interpretive and constructivist approaches focus on how actors co-create futures through narratives, values and collective meaning. Critical perspectives, in turn, draw attention to the power relations that shape which imaginaries become dominant.

Rather than treating these paradigms as incompatible, TFDT positions them as complementary layers of analysis. A realist ontology anchors futures in causal mechanisms and system dynamics,

Table 2 Methods mapped to Bergman *et al.* (2010) and corresponding TFDT constructs

Bergman Quadrant	*TC**	*EC**	*Method*	*Primary function*	*TFDT construct*	*Ontology***	*Epistemology***	*Orientation*
Prediction	Y	Y	System Dynamics/ Agent-based Simulation	Stress-test system dynamics and mechanisms	Time Space Entropy	Realist	Post-positivist	Quantitative Mixed
			Mechanism Mapping/ Process Tracing	Uncover causal process chains	Time Space Agency	Realist/ Constructivist	Post-positivist Interpretive	Qualitative
			Learning from the Past (structured)	Conditional projections with causal justification	Space Time Agency	Realist	Post-positivist	Mixed
			Mixed-method Triangulation (e.g. Delphi + Simulation)	Integrate insights for causal adequacy	***	Pluralist/ Pragmatist	Post-positivist Interpretive	Mixed
Prognosis	Y	N	Time-series, econometrics	Baseline extrapolation	Time Uncertainty	Realist	Positivist	Quantitative
			Delphi (classical)	Consolidate probabilities (consensus)	Space Uncertainty	Realist	Post-positivist	Mixed
			Trend impact analysis/ historical analogy	Extend trajectories, estimate event impacts	Space Time Agency	Realist	Post-positivist	Mixed
			Fuzzy Delphi	Integrate uncertainty judgments	Agency Uncertainty	Critical Realist	Post-positivist Interpretive	Mixed
Science Fiction	N	Y	Cross-Consistency Assessment (CCA)	Check internal coherence of scenario sets	Time Uncertainty	Constructivist/ Realist	Post-positivist	Mixed
			Morphological analysis	Structure driver/ state spaces; combine logics	Time Space Uncertainty	Constructivist	Interpretive	Mixed
			Delphi (exploratory/ explanatory; Policy Delphi)	Elicit divergent causal assumptions and hypotheses	Space Agency Uncertainty	Constructivist	Interpretive	Mixed
			Scenario Writing/ Storytelling (incl. CLA)	Compose coherent alternative futures	Time Space Agency Uncertainty	Critical/ Constructivist	Interpretive	Qualitative
			Design Fiction/Sci-Fi Prototyping	Trigger imagination; test assumptions	Space Uncertainty	Constructivist	Interpretive	Qualitative
			Serious Games/Role-Play	Experiential sense-making with stakeholders	Space Agency Uncertainty	Constructivist	Interpretive	Qualitative (participatory)
			Visioning/Normative Delphi (+Backcasting)	Define desirable futures and pathways	Space Agency Uncertainty	Constructivist	Critical Interpretive	Qualitative Mixed
Utopia/ Dystopia	N	N	Dystopian Scenario Writing	Cautionary narratives/stress cases	Time Space Uncertainty	Constructivist	Interpretive	Qualitative
			Dystopian Design Fiction/Stress Games	Explore extreme "what-ifs"	Space Uncertainty Entropy	Constructivist	Interpretive	Qualitative (participatory)

Note(s): * TC = Truth Claim; EC = Explanatory Claim, Y=Yes, N=No; ** descriptive Ontology/Epistemology (i.e. not constitutive); *** depends on the methods

while a constructivist ontology captures participatory and interpretive processes of sense-making. The combination allows TFDT to explain both the structural and the discursive dimensions of anticipation: how futures are constrained by material realities and simultaneously constituted through social imagination.

This philosophical pluralism gives TFDT its integrative power. It bridges forecasting, interpretation and critique within one theoretical architecture. It reflects the hybrid nature of tourism itself and provides the conceptual depth needed to advance tourism futures research beyond methodological eclecticism. In doing so, TFDT transforms foresight from a technical exercise into a theoretical practice that unites explanation, imagination and reflexivity.

6.3 Dynamics of time, space, agency, uncertainty and entropy

At its core, TFDT proposes that tourism futures unfold through dynamic interactions among five constructs. Time structures anticipation and memory, distinguishing between short-term forecasting and long-term visioning. Space provides the arena of change where forces of stability and transformation collide. In a practical sense, this covers the scenarios of destinations, networks and digital realms. Agency captures the energy actors invest to maintain or redirect futures, including governance, innovation and coordination. Uncertainty expresses both risk and creative potential. Entropy, finally, reflects the intrinsic tendency of systems to drift into "disorder" when energy inputs decline. The relationship among these constructs explains the fluid nature of tourism futures. High entropy (e.g. observable in fragmented governance, fading commitment or institutional fatigue) can erode resilience and increase vulnerability to shocks. Conversely, strong agency directed across temporal and spatial boundaries can reverse entropy and generate renewal. The cases of Venice and Bali illustrate these dynamics: overtourism in Venice demonstrates how entropy accumulates when stakeholder cohesion disintegrates, while Bali's post-pandemic recovery shows how collective agency can reimagine futures under heightened uncertainty. Likewise, climate adaptation in Alpine destinations exemplifies long-term temporal agency counteracting systemic entropy through sustained energy inputs and shared purpose. TFDT therefore conceptualizes tourism futures as systems in motion, where feedback loops between agency, uncertainty and entropy determine stability or transformation. This extends complexity theory (Baggio, 2008) by adding interpretive and normative dimensions – acknowledging that meaning, legitimacy and power shape how systems self-organize or disintegrate.

6.4 Normative and critical implications

Futures are not only dynamic but contested. TFDT situates agency within relations of power: whose futures are envisioned, whose are marginalized, and who mobilizes energy against entropy. Integrating insights from critical futures (Inayatullah, 1998; Yeoman *et al.*, 2022), TFDT exposes asymmetries that structure anticipatory governance, e.g. North–South divides, public–private imbalances and elite–grassroots hierarchies. This perspective strengthens the ethical dimension of foresight. It recognizes that the legitimacy of imagined futures depends on inclusivity and reflexivity. TFDT encourages scholars and practitioners to interrogate the narratives that underpin scenario work: which voices set the temporal horizon, define the spatial scope and shape perceptions of uncertainty? By doing so, it transforms futures research from a technocratic exercise into a deliberative process that links anticipation to justice. Applied foresight practices informed by TFDT can therefore foster pluralistic and participatory scenario design, integrating marginalized worldviews and alternative imaginaries. This aligns with the broader human-centred turn in futures studies and advances the discipline from forecasting towards foresight as ethical practice.

6.5 Methodological and practical implications

For researchers, TFDT provides a coherent structure for empirical and methodological development. It legitimizes methodological pluralism while avoiding eclecticism: each method

contributes specific insights when mapped to a construct. Forecasting captures temporal continuity; Delphi elicits collective agency; horizon scanning reveals spatial interdependencies; causal layered analysis exposes deep narratives and uncertainties. When combined systematically, these approaches yield explanatory depth rather than fragmented description.

Concrete applications already illustrate this potential. Postma and Yeoman (2021) show how scenario thinking framed through systems theory helps destinations handle disruption, operationalizing TFDT's time–space–agency triad. Gretzel *et al*. (2015) demonstrate how smart tourism ecosystems redistribute agency across platforms and compress spatial–temporal dynamics, useful for TFDT's digital-space interpretation. For Arctic contexts, Nilsson *et al*. (2021) review and improve participatory scenario methodologies, providing a robust template for uncertainty and stakeholder engagement. National foresight programs such as Visit Finland's (2021, 2022) reports illustrate how continuous monitoring and scenario maintenance can reduce systemic entropy by sustaining attention and coordination over time.

Methodologically, TFDT also supports structured triangulation. Durance and Godet (2010) demonstrate how scenario building can integrate techniques such as Delphi, morphological analysis and causal layered analysis within a disciplined foresight process. This is an approach that TFDT frames theoretically through its relational constructs.

For practitioners, TFDT redefines foresight as a continuous process of energy maintenance rather than a one-off scenario exercise. Destinations and organizations must treat futures as living systems requiring sustained agency. The Finnish foresight model, for example, institutionalizes regular updates and participatory review, showing how strategic energy inputs counteract entropy. Similarly, Yeoman *et al.* (2022) describe how scenario planning for New Zealand tourism after COVID-19 integrates realist forecasting with constructivist stakeholder dialogue, balancing quantitative constraints and social legitimacy.

At the destination level, TFDT implies that foresight should culminate not in static reports but in institutional learning loops linking research, governance and market behaviour. Such dynamic foresight architectures enable adaptive governance and cross-stakeholder coordination. These elements are key competencies for tourism systems navigating technological disruption, climate volatility and global uncertainty.

6.6 Limitations and avenues for further research

TFDT, as presented here, is a conceptual synthesis rather than an empirically tested model. Its constructs (i.e. time, space, agency, uncertainty and entropy) remain theoretical and require operationalization for empirical analysis. The use of entropy is metaphorical, capturing systemic drift rather than serving as a measurable variable; translating this construct into quantifiable terms will demand methodological innovation. Furthermore, the framework has been developed primarily within Western epistemological traditions and should be expanded to incorporate indigenous and Global South perspectives to enhance cultural inclusivity and epistemic diversity.

Future research should pursue empirical validation by modelling interactions among the five constructs in destination foresight programs and assessing how these relationships shape scenario evolution. Comparative applications across urban and rural systems, or between Global North and South contexts, could test the theory's transferability. Methodological development is also needed to design hybrid foresight processes that combine forecasting, participatory visioning and critical reflection under a TFDT framework. Longitudinal studies could explore how narratives and actor constellations change across iterative foresight cycles, providing evidence for TFDT's dynamic assumptions. Finally, a normative research strand should examine inclusivity and legitimacy in futures work (i.e. whose futures are imagined, and how such imaginaries gain authority within governance and planning). Together, these lines of inquiry will determine whether TFDT can evolve from a conceptual foundation into a generalizable theory of socio-technical change and anticipation.

6.7 Concluding synthesis

TFDT provides a coherent theoretical lens for understanding how futures in tourism emerge, persist and decay. It reframes foresight from a collection of techniques into a dynamic system in which time, space, agency, uncertainty and entropy interact continuously. This systemic view explains not only how futures are constructed but also why they drift or stabilize through feedback among these constructs. By grounding these relationships in epistemological and ontological pluralism, TFDT moves the field beyond method-driven eclecticism towards an integrated explanatory framework that connects forecasting, interpretation and critique.

The theory advances tourism-futures scholarship in three ways. First, it reconceptualizes futures as evolving configurations that require sustained agency to counteract entropy, thereby transforming resilience from an outcome into an ongoing process. Second, it positions scenario planning as a meta-method that gives coherence to diverse foresight tools by linking each to the underlying constructs of TFDT. Third, it bridges micro-level actor dynamics with macro-systemic evolution, establishing a meso-theoretical perspective capable of uniting individual behaviour, governance and structural change within one analytical model.

For researchers, TFDT offers a conceptual map that aligns empirical methods with explanatory constructs and provides a platform for theory building in anticipation studies. For practitioners, it reframes foresight as a continuous governance process that demands attention, coordination and renewal rather than a one-off exercise in prediction. Ultimately, TFDT positions tourism futures as a generative science of change, an endeavour that not only interprets possible trajectories but also reveals the dynamic forces that make futures imaginable, contestable and actionable.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author utilized ChatGPT 5, and Grammarly to rephrase his own thoughts, check and correct grammar, improve readability. After using these tools, the author reviewed and edited the content as needed and took full responsibility for the content of the published manuscript.

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Corresponding author

Stephan Bingemer can be contacted at: stephan.bingemer@hs-heilbronn.de