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Narratives of sustainability in digital media: An observatory for digital narratives

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A B S T R A C T

Making the profound societal transitions and transformations called for in the UN Sustainable Development Goals for 2030 (UN, 2019) and beyond is a critical and urgent challenge for humanity. We propose the collection and analysis of digital narratives (DNs) to observe and assess significant concerns about sustainability and resilience (e.g., as reflected by social movements and interests). Observing temporal changes, globally, in the frequency, sources, and content of DNs can illuminate emerging trends in perceptions, attitudes, norms, hopes or fears of individuals and groups. Of particular interest are movements towards acceptance of, or resistance to, locally adaptive pathways to sustainable futures. We propose forming a Digital Observatory of Narratives of Sustainability (DONS) as a collaborative platform with associated open-source tools for analyzing and representing the societal landscape and its dynamics, thereby providing data to help model future societal trajectories and develop approaches to cope with systemic risks. The DONS opens a rich field for inter- and trans-disciplinary research on sustainability through narratives and their dynamics in different contexts and cultures.

1. The significance of digital narratives about sustainability

Profound societal transitions and transformations are needed to reach the UN Sustainable Development Goals (SDGs) for 2030 (United Nations, 2019). Meeting the challenge calls for understanding and addressing how communities and individuals envision sustainability and their willingness to enact that vision, which is influenced by social identities, contexts, resources, and cultures. Narratives expressing community visions of sustainable futures contain valuable information about concerns and priorities for addressing or opposing the most community-relevant sustainability goals (Chabay et al., 2019).

We use the term *narrative* to refer to a purposeful, affective form of human communication, which is an important interface to the normative landscape of culture and context. Expressed in many possible formats, narratives contain stories, actors, scenes that reflect and help maintain the cultural identity of a group or community or express a desired or feared vision of its imagined future. The power of narratives come from the affective engagement of the audience/receiver in part through evocation of social identities and in contrast to story content, which is only a part of a narrative (Maggs & Chabay, 2022). Narratives generally have three components that may be difficult to disentangle but provide qualitative and quantitative data for analysis: 1. the *content* (i.e., the component normative expressions and the message delivered through their narration), 2. The *pattern* employed (i.e., how they are told and what is not told), and 3. the *strength* of their resonance and the prominence they take in receivers' shared meanings and vision.

The prominence of narratives in formulating human perceptions and guiding decision-making permeates visions of and actions towards sustainable futures (Bruner, 1991; Morgan & Wise, 2017). All individual and collective decisions are framed in the context of locally predominant narratives and associated narrations that express personal experiences (Koch et al., 2021), regardless of the universality of the framing narrative (van der Leeuw, 2020). Local narratives (e.g., Lyotard, 1979) are often drawn from stories about events that shape how individuals see themselves in terms of their (multiple) social identities. Furthermore, narratives often serve as boundary objects (Star, 1989) to facilitate dialogue between parties regarding complex and contested issues.

Narratives have become prominent in the digital sphere. The number of narratives circulating in the digital space is increasing rapidly. Digital narratives (DNs) reflect and add to other forms of narratives that endure and are broadly recognized by members of a group (Koch et al., 2021). Expressions in the digital space are a window for assessment of emerging and persistent DNs on supporting or opposing movements towards sustainability and societal resilience. Circulation in the digital realm (e.g., social media posts, blogs, online fora, and news media communications) has the potential to accelerate the process of "naturalization" (e.g., Shonfeld et al., 2021; Aksan & Alkin, 2014) or adoption of DNs that are salient and compelling. In this digital space, groups may be defined by geographic co-location or by shared beliefs, interests, and/or purpose (Forsyth, 2014; Lickel et al., 2000). The digital space contains both individual and group-led initiatives, as well as allowing rapid dissemination of group communications – both top-down (one-to-many) and bottom-up (many-to-many) – that fundamentally serve as "worldmaking" vehicles (Vervoort et al., 2015).

There is increasing awareness of the value of narrative analysis and the use of narrative communication in both research (Neeley et al., 2020) and applied efforts across disciplines in the global sustainability arena (e.g., TWI2050, 2019). The use of DNs that we advocate is inherently different from efforts to persuade action towards sustainability, e.g., the Narrative Policy Framework (Jones & McBeth, 2010). Rather, a systematic and continual assessment of DNs serves to provide vital information as to individuals' and groups' expressions — of perceptions and attitudes and their changes over time regarding sustainable futures. Careful observation and analysis can lead to insights into the origins of social alienation and susceptibility for misdirection. This approach aligns with Koch et al.'s (2021) consideration of narratives in the environmental governance space as vehicles for reasoning and meaning-making that imply more than an individual's personal experience. The largely inductive process that we advocate leverages quantitative and qualitative data from the digital sphere. A diversity of methods and analyses would be required (e.g., machine-learning based topic modeling; ethnographic analysis; grounded theory). These analyses would be substantially enabled by creation of a Digital Observatory of Narratives about Sustainability (DONS). The DONS and the resulting analyses would facilitate recognition of behavioral attitudes, responses, and decision pathways leading to desired objectives aligned with imagined futures (Beckert, 2013) and grounded in public narratives.

2. A digital observatory of narratives about sustainability (DONS)

There are rich sets of DNs that address sustainability; these narratives may arise from or spur development of social movements, such as Fridays for the Future, Meatless Mondays, "right-to-repair" initiatives and movements, and upcycling efforts (i.e., creative use of materials at the end of their typical lifecycle) across scales and economic sectors.

Attention to the systemic nature of narratives is especially critical when considering DN generation and propagation because of the importance of collective behavior change for moving to sustainable futures and because digital platforms allow inherently localized issues to be recognized as being sufficiently salient to issues in other locations and communities. Furthermore, narratives related to sustainability may address any of the specific issues of sustainability (e.g., implementation targets of the UN SDGs) that are relevant locally and which necessarily are also components of a complex system that develops over multiple temporal and spatial scales.

Fazey et al. (2013) and Glynn et al. (2017) note that knowledge systems include the practices, routines, structures, mindsets, values, and cultures affecting what and how knowledge is produced and used, and by whom. In DNs, which circulate rapidly and widely in many-to-many exchanges, multiple knowledge systems are brought forward by different participants in the exchange. This leads to competing narratives, which resonate to varying degrees with different individuals or groups and can lead to the splintering of social groups (Glynn et al., 2022a) or to disparate behavioral responses and decisions (Glynn et al., 2022b). We posit that the challenges and opportunities in the use of emergent DNs to envision and motivate actions towards sustainable futures result from the intersection of (1) DN forms, structures, and modes, (2) resonances and responses to DNs in certain communities, contexts, cultures, and (3) human behavioral constraints or controls in those contexts. Koch et al. (2021) present a conceptual framework combining narrative research with insights from social structure and group dynamics on behavior to generate testable hypotheses on local and regional environmental governance – a subset of sustainability narratives. They find that additional attention is needed for analyses in the digital sphere. These analyses could be done with the DONS that we propose.

The DONS would be an open access, curated, collaborative platform that would collect and allow analysis of narrative evidence of societal attitudes, beliefs, values, and imagined futures regarding sustainability (Beckert, 2013), including possible connections to observed behaviors. The DONS would offer capabilities analogous to those of the Landsat satellite and mission (Molder et al., 2022),

albeit for societal landscapes, characteristics, and dynamics. Users of the DONS would include a wide range of knowledge holders and seekers: scientists and scholars; cultural experts; resource, hazard, and risk managers; regulators and policy makers; interested members of civil society, and other stakeholders. Leveraging transdisciplinary communication modes, experiential lenses, and knowledge bases, the DONS would offer unprecedented and important capabilities for research to benefit policy and advance pathways towards sustainability. The structure and operations of this open, curated (to avoid nefarious use) platform would adapt to meet the needs of the various user communities.

Two factors are particularly important when considering the DONS. Firstly, there are differences and similarities exhibited at different scales in behavioral dynamics, from small group(s) to self-identified "tribe(s)" to the global community. This highlights the issue of linking global concerns (e.g., SDG-relevant issues) with local aspirations and conditions in the diversity of communities of interest, practice, and belief. In the digital sphere, local narratives are widely available regardless of geographic proximity. Narratives may resonate within or across groups for people who recognize important connections between climate-change induced drought or floods across geographic contexts, or on issues that include broad societal concerns, such as social justice, or trans-boundary impacts of local actions (e.g., smoke from intentional or wild fires or solar geo-engineering). Secondly, the collective vs. individual sense of agency for decision making about sustainable futures is also important, and may come through various considerations, including:

(1) Temporal and spatial locality: *what issue(s) is/are most frequently or most intensely expressed in the DNs from a group*?
(2) Stimulus: *does the narrative relate to an acute shock, a chronic stressor, or a multi-faceted complex event?*

Changes in attitudes, norms, societal practices, and behaviors affect the evolution of narratives and their wider circulation. As DNs circulate within and across groups, they may stimulate changes in attitudes, provoke actions, and evolve in content and forms of expression.

The DONS concept goals include:

- Enabling systematic collection and analysis of DNs that pertain to issues of sustainability – such as defined by, but not limited to the SDGs – and obtained from diverse communities and different contexts.
- Developing and improving methods for narrative analysis and their effective use in modeling of societal processes.
- Identifying the underlying basis of both negative and positive sentiments affecting societal responses and action on sustainability issues.
- Identifying, understanding, as well as testing response(s), scenarios, and pathways in a timely and effective way – as relevant to needs/concerns expressed in DNs.

As noted in *The World in 2050 Report*, "context specific narratives on sustainability futures are becoming imperatives and pre-conditions for moving towards sustainable pathways at local, national and global levels" (TWI2050, 2019). To this point, narratives as frames are increasingly employed largely within Integrated Assessment Models (IAMs) and other efforts to analyze potential pathways and their impacts towards the SDGs and the Paris Agreement (i.e., Paris Climate Accords). Yet, IAMs apply narratives, pathways, and policy assumptions that depend upon *ad hoc* assumptions of societal change and governance (O'Neill et al., 2020). Harvesting DNs through observation and assessment, can help researchers and practitioners understand challenges, visions, and fears and thereby better capture dynamic information on perceptions and potential acceptance of, or resistance to, implementation of sustainable futures. This allows for better baselines for modeling future trajectories. Thus, DNs can offer important data, such as understanding perceived or disregarded limits on resources that may restrict future pathways. These parameters are typically absent or under-specified in models of actions towards sustainable futures and are critical for decision-making.

Methodologies available for the study of DN evolution and spread may be combined to complement weaknesses of any one approach employed in isolation within the DONS. Data sources may include digital data from news sources and social media, reviews of online petitions, and internet search trend analyses. Furthermore, there may be scope to conduct direct data collections using (quasi) experimental techniques in the digital sphere to help understand decision-making by individuals and groups in formulating DNs when exposed to different forms and sources of information.

Developments of predictive analytics may improve use of DNs through advancements in content analysis augmented by Natural Language Processing (NLP), sentiment analysis, and network analysis. Due to the digital footprints and time stamps of DNs and the networks of stories that support them, exploring propagation, modification, or attenuation of DNs across collectives may prove more tractable than in the analog space. Observing temporal changes in the frequency, sources, and content of DNs can illuminate emerging trends in perceptions, attitudes, norms, hopes or fears of individuals and groups. Of particular interest are trends in acceptance of, or resistance to, locally adapted pathways to sustainable futures. These trends may provide indications of when and how to co-design policies and actions which address concerns salient in each community; with the caveat that DNs may not reflect all groups/individuals due to unequal access or use of digital media.

One approach to developing and maintaining the DONS would involve the following steps:

- Create and maintain an open data platform of continually collected narratives in digital format on issues that pertain to sustainability and the SDGs.
- Link the narrative expressions to the community (group) of origin and strive to trace the chain of communication from source to end-points.
- Develop a protocol for coding of keywords, phrases, and images to identify themes in the collected narrative expressions.

- Engage research team(s) in coding and cross-checking results to build a dynamically updated set of expressed concerns regarding sustainability in particular communities.
- Refine iteratively the coding and ethnographic analysis processes to improve the capability of the platform and to better understand the relationships among narratives in their social-ecological contexts.
- Categorize the emergence, circulation and evolution of sustainability narratives and counter-narratives in identifiable social-ecological and spatially-defined environments to develop a systematic understanding of their relation to place and context.

We recognize that, in the digital sphere, analysis largely traces "shadows" that reflect aspects of the "where, when, what, who, how, and why" in the thoughts and responses of individuals and collectives filtered through the narratives they produce (and share). Additionally, narratives may be (re)formulated to appear more socially acceptable or to avoid censure, in which case DNs (and individual narrations[5]) may take a form of coded signals of bias. Through building up a catalog of such DNs, possibly coupled with observation of actions and other response indicators, potential users of the DONS may start to understand intended meanings and societal indicators associated with given DN's and collectivities.

As an ambitious use case of the DONS, we propose using DNs on social media to map public narratives onto aspects of Shared Socioeconomic Pathways (SSPs) (Riahi et al., 2017; O'Neill et al., 2014). The construction and formulation of these SSPs matter. They serve as policy interfaces and conduits to motivate and track progress towards SDGs. Defined as "framing narrative scenarios", the five SSPs are largely high-level and nonspecific. However, teasing out narrative pathways as digital narrative ontologies emerging across collectives is critical to providing empirical data to strengthen SSPs. Empirical study of societal concerns and the dynamics in the society reflected in DNs will provide a more informed basis for structuring the SSPs. Ontological ambiguity may be reduced through systemic studies of DNs. Researchers and practitioners involved in these studies will more fully appreciate the boundaries of SSPs and may develop emergent narrative ontologies that map across collectives and their values, resources, experiences, and resultant worldviews.

Tracking and manipulation of DNs is already being done by various institutional and governmental actors to (a) influence opinions (impression management) of various actors (e.g., Stukal et al., 2019), (b) counter digital narratives and associated societal behaviors and attitudes seen to be harmful (Marcellino et al., 2020), and (c) influence opinions on important issues, such as climate change (e.g., Runge, 2021). There are commercial firms that use machine learning tools to collect data from social media for policy and marketing purposes. This can also be used to inform more realistic policy development and decisions, and, for example, advance analysis of the feasibility of SSPs. The SSPs are in essence narrative-based and in their current form reflect only a snapshot at a given moment in time. As narratives evolve, time series and other information accumulates, it becomes possible to chart potential trajectories and determine the differences between projected and actual pathways. SSPs are top-down views. DNs offer bottom-up resources and their generative quality is critical.

Trending internet searches and tweets have been used to understand narratives related to sustainability, such as epidemic outbreaks (Towers et al., 2015) and the association between the COVID-19 pandemic and related mental health issues (Tubadji et al., 2021). Patton et al. (2014) review the use of social media to trace both digital and offline (i.e., in-person) consequences and actions related to gang violence. Such methods can be more broadly applied to understand sustainability issues in context and—detecting and understanding unexpected links between spatially or temporally distributed interdependent sustainable pathways across multiple scales.

Digital narratives expressed after the occurrence of acutely experienced extreme events contain information regarding human needs, attitudes, visions of recovery, opportunities for societal behavior change, and social learning. Narratives often seek to place responsibility or blame for an extreme event on given individuals or sometimes on specific political constituencies. Recent examples of divisiveness and of social/political factors that amplified the effects of disasters include narratives related to winter storm Uri in the US (Towers et al., 2022) and to the July 2021 floods in Germany (The Economist, 2021). Other narratives seek to absolve blame by either saying that the event was unique in experienced human history and therefore could not have been predicted, or by saying that it was beyond the control of any local collectives or individuals.

The DONS promises to break new ground by adopting argumentative discourse analysis and the concept of discerning narratives from digital story networks to the study of institutional complexity. We argue that beyond the messy surface of institutional complexity, there may be a surprising degree of convergence, in the sense of discursive hierarchies that run across institutions, practices, and scales.

3. Conclusions and next steps

Data and knowledge generated by collecting and understanding narratives that circulate among individuals and groups can be used to explain and model the diverse social landscapes and dynamics that affect (and reflect) sustainability visions and pathways. The Digital Observatory of Narratives about Sustainability (DONS) will provide a platform to collect digital narratives and to build an interpretive, digital ethnographic knowledge base. In parallel, requisite analytical methods and tools for communicating about sustainable futures will be developed and refined. Narratives, and more generally stories, can act as critical complementary qualitative

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[5] We use the term "narration" as a mode of expressing personal experiences and (re)formulating expectations play an essential role when actors engage with each other (e.g., Ryan, 2007). The individual narrations told by actors produce narratives that can either support or obstruct incremental shifts or radical transformations, because they legitimize or abate behavioral and policy change (e.g., Bietti et al., 2018, Dunbar, 2014).

Box 1. The digital space, while imbued with the imagination of multiple individuals, sometimes converges on shared perspectives or visions for sustainability. For instance, reflecting urgency and concerns about climate change, the Fridays for Future (FFF) movement unites youth from more than 7500 cities in calling for more ambitious climate actions with slightly different narrations inherent across individuals. Fridays for the Future communities around the world have co-created a potent grand climate narrative of intergenerational responsibility for minimizing climate change, while reflecting the diversity of different cultures and societies. Moreover, FFF expresses a narrative that indicts policy makers and corporations for continuing failure to protect future society from global warming. Aside from collecting narratives such as those of FFF, the DONS could provide access to machine-based topic modelling, to detailed narratology and ethnographic assessments, and to other tools and methods.

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information to support quantitative assessments (Chabay et al., 2019; Moezzi et al., 2017). Transdisciplinary expertise is needed to trace the networks and priorities of individuals, groups, and institutions engaged with issues in their contexts by using the digital narratives (DNs) circulating through these networks. This will allow users of DONS (researchers/practitioners and communities/groups) to: (1) identify strategic priorities; (2) map vulnerabilities; (3) improve collaboration and coordination; and (4) improve agility, flexibility, and responsiveness; (5) improve knowledge management for mitigation and adaptation strategies. In short, understanding and characterizing narratives is needed to assess the social-ecological-economic feasibility of identified paths to more sustainable futures in the context(s) of a diversity of collectivities, conditions, and cultures (e.g., Shiller, 2017).

Understanding public perspectives on sustainable futures, as well as competing and complementary objectives and system components, can improve the fit of models to socio-environmental conditions and potential pathways. This may stimulate a deeper understanding by researchers and practitioners as to how individuals and communities can be helped to incorporate locally relevant issues of sustainability in their perceptions of the present and in their visions of the future.

The DONS is envisioned to provide information on societal perspectives on sustainability issues and on the dynamics of social movements or perceptions, which in turn, informs both researchers/scholars and practitioners seeking to understand and instantiate collective behavior change. The process of tracing DNs allows for consideration of worldmaking (Vervoort et al., 2015) in a manner that extends the boundaries and inclusiveness of potential sustainable pathways. Akin to citizen science techniques and *photovoice* projects, there may be scope to employ techniques that can improve and make more inclusive the consideration of DNs from less advantaged or marginalized populations.

The methods to garner DNs and analyze their production, circulation, and reception are many and varied. However, their use is largely nascent and can be expanded widely to provide critical data and observations towards sustainability futures. The digital space is expanding. Many across the globe who have not been previously digitally connected are connected at present or will be connected in the next few years. Therefore, development of the DONS is pressing. It is envisioned to provide information on narratives currently in circulation and on their evolution in response to the changing landscape of sustainability issues. By collecting DNs at the individual and group levels over time, we will develop an ability to survey and understand the emergence of narratives towards potential sustainable futures and the obstacles faced in different cultures and contexts. There will be epistemic uncertainties in narrative ontologies and definitions. However, large scale continued collections may progressively allow improved understanding of emerging narratives and their context within collectivities. We argue that this knowledge and the development and curation of a DONS and associated methods are essential to improving societal sustainability futures.

Humanity is confronted by a complex, rapidly changing, landscape of knowledge, policy, and practice. This short communication is an open invitation to a developing field of research and to the development of the DONS as a virtual hub and open-source knowledge base to facilitate the research needed. We seek collaborations across partner organizations, research groups and individuals, to address the need and seize the moment to construct and maintain the DONS. The knowledge, learning, and societal change international research alliance (KLASICA 2.0), will provide a platform for setting up, maintaining, and providing curated access to the DONS and to share in harvesting new understanding to further accelerate collective behavior change in transitioning to sustainable futures in communities and regions across the world.

Box 2. KLASICA was initiated by Ilan Chabay in 2008 and formally launched in 2011 as the knowledge, learning, and societal change international research alliance. KLASICA's mission is to build the capacity for and facilitate constructive collective behavior change to sustainable futures in different cultures and contexts around the world. In the past decade, KLASICA has organized and conducted ten workshops and symposia with international senior and early career academics, practitioners, and artists.

One of the key learnings from KLASICA's first decade of activity concerns the use of narrative in both formal and informal senses, which offers an invaluable interface to the normative landscape embedded within a particular context and a powerful way to engage society meaningfully in that landscape.

KLASICA 2.0 is being launched as an international collaborative research hub and resource platform. KLASICA 2.0 will be an *open hub for catalyzing innovative thinking, research, and practice through active collaboration among people in the arts, humanities, social sciences, natural sciences, medicine, and engineering, as well as practitioners from all sectors of society.*

Declaration of Competing Interest

The authors declare no competing interests.

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