Terrain, Topography, Landscape, and Place: The Interplay of Environment, Culture, and Conceptualization

– Invited Paper –

Bill Palmer

School of Humanities, Creative Industries and Social Science, University of Newcastle, Australia

The theory of sociotopography has attempted to model the complex relationship between the topographic environment in which humans live, sociocultural factors, and language. This paper takes some first steps towards extending this to landscape and place. It argues that the human environment comprises terrain (raw landforms) and topography (terrain plus human modification), and that humans construct conceptual representations of this environment in the form of landscape (a mental representation of topography, its chunking into features, and the categorization of those features); place (regions or features of landscape assigned an individual identity); and geocentric relations (the representation of spatial relationships anchored in landscape). The paper presents five case studies exemplifying the role of sociocultural factors in mediating between topography and conceptualization: where affordances and characteristics of the topography motivate landscape categorization and notions of place; where social beliefs and practices are mapped on to motivating aspects of topography, underpinning categorization of landscape and place; where sociocultural structure is mapped onto topography without apparent motivation from within the topography; and where conceptual representations appear to respond to the environment directly via perception without sociocultural mediation. The paper presents a tentative expanded sociotopographic model including conceptual representations of landscape, place and geocentric relations, and a more fine-grained model of environment as terrain and topography.

Keywords: sociotopography; landscape; place; terrain; language; sociocultural practices and structures; ethnophysiography

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1 Place, Landscape, and Language

Places are not objective entities in the world, and references to place with toponyms or by other means are not neutral locators. They are instead dependent on perspective and filled with individual and group meaning (Dingemanse et al., 2017, p. 129). They are intersubjective, but not merely as bundles of shared meanings – they are constructed in part through the referential choices made by individuals in interaction (Enfield and San Roque, 2017, p. 584f). Places may be attached to features in landscape. However, landscape features themselves are not objective. Although landscape is anchored in actual topography, it is a conceptual representation of that topography, and conceptualizing the environment appears to have no universal ontological foundations (see Burenhult and Levinson, 2008, p. 137f). As a conceptual representation, landscape is constructed by individuals and communities, to a large extent driven by the affordances of the environment (characteristics of an object or an environment

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that relate to the potential for an organism to interact with it; Gibson, 1977), and by the nature of each individual and group of individuals' engagement and interaction with that environment. The relationship between the environment on one hand, and landscape and place on the other is mediated by sociocultural practices, structures, and meanings.

The theory of sociotopography has attempted to model the complex network of factors at play in the relationship between the environment, human behaviour, and language (Palmer et al., 2017). However, so far sociotopography has not explicitly attempted to build in conceptual representations of space, landscape and place. This paper takes a tentative step to develop the sociotopographic model in this way.

Section 2 of the paper outlines sociotopography. Section 3 extends this with consideration of the role of human modification of the environment, and conceptual representations in the form of landscape and place. Section 4 considers the role of language and sociocultural mediation in conceptual representations of the environment, and Section 5 takes a tentative first step in exploring integration of conceptual representations of landscape and place into the sociotopographic model. Finally, Section 6 presents five case studies exemplifying construals of landscape and the extent to which they are motivated by environmental features, socioculturally mediated: landscape categorization and social organization motivated by features of the topography; social organization associated with topography but without an apparent topographic motivation; and landscape categorization apparently responding to perceptually accessed features without apparent sociocultural correlates.

2 Sociotopography

Languages differ widely in the ways they encode both spatial relations and landscape. Strategies for encoding spatial relations have been shown to typically correlate with strategies used in non-linguistic spatial behaviour (Levinson, 1996, 2003; Pederson et al., 1998), although recent work has shown that mismatches do occur (Bohnemeyer et al., 2022). Widespread cross-modal correlations in strategy preference across domains such as language, gesture, memory, and inferential reasoning have led to ongoing debate. On one side are those who argue that these cross-modal correlations provide evidence for linguistic relativity – the influence of language on cognition (Bohnemeyer and Levinson, 2011; Dasen and Mishra, 2010; Levinson, 2003; Levinson et al., 2002; Majid et al., 2004; Pederson et al., 1998). This argument has attracted criticism and counter-evidence (e.g., Gallistel, 2002; Li et al., 2011; Li and Gleitman, 2002; Newcombe, 2005), which in turn has been criticized. Other work has explored the possibility that linguistic spatial representations are not arbitrary but are shaped at least in part by the topographic environment in which a language is spoken, suggesting that the environment underpins both linguistic and non-linguistic spatial behaviour (Palmer, 2015).

Recent work has shown that diversity in spatial language and behaviour exists not only between language communities, as has been the traditional research focus, but also within communities. The extent to which this is also true of landscape is as yet unknown. Languages make a range of spatial referential strategies available to their speakers, but speakers vary in which strategies they prefer, and in which contexts (Lum et al., 2022; Palmer et al., 2017). Some community-internal variation correlates with environment: urban versus rural (Dasen and Mishra, 2010; Lum, 2018; Pederson, 1993, 2006); coastal versus inland (Ameka and Essegbey, 2006); island versus suburban (Schlossberg, 2019); and grid versus irregular road and boundary patterns (Lawton, 2001). Individual humans may also employ different strategies depending on the nature of the specific task (Bohnemeyer, 2011; Mishra et al., 2003; Senft, 2001; Tenbrink, 2022; Wassmann and Dasen, 1998). However, other variation correlates with individual demographic variables such as occupation (Bohnemeyer, 2011; Lum, 2018; Shapero, 2016, 2017), gender (Bohnemeyer, 2011; Bohnemeyer and Stolz, 2006; Danziger, 1999; Lawton, 2001; Le Guen, 2011; Lum, 2018), age (Cerqueglini, 2022; Dunn et al., 2021; Edmonds-Wathen, 2012, 2022; Lum, 2018; Meakins, 2011; Meakins and Algy, 2016; Meakins et al., 2016; Robbers, 2022; Turk, 2020, p. 124; itself in part epiphenomenal for generational lifestyle changes, bilingualism and cultural contact), and other such variables. Different communities speaking the same language may vary according to dominant subsistence mode (e.g., fishing communities versus communities dominated by indoor work and small scale farming; Lum, 2018). However, it is possible that sociocultural variables such as gender, occupation, and subsistence mode may themselves relate to the environment: they may be epiphenomenal for the nature and degree of interaction with topography engaged in by individuals and groups within communities (Lum et al., 2022; Palmer et al., 2018a,b, 2017). The interplay

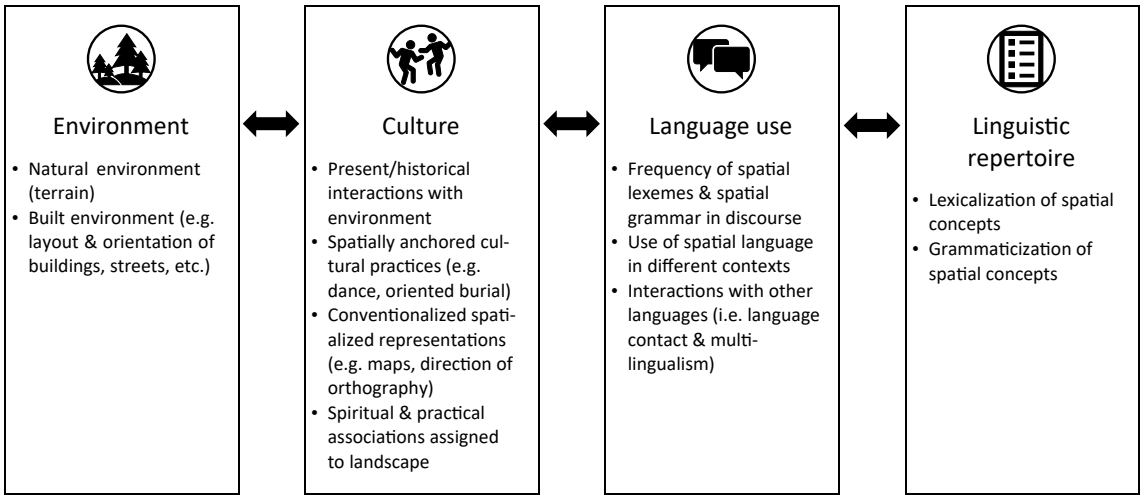

Figure 1: The Sociotopographic Model (STM) as previously proposed. Adapted from Lum et al. (2022) and Palmer et al. (2017).

of environmental, social, cultural, and linguistic factors is much more complex than traditionally recognized (but see Bohnemeyer et al., 2015, 2014; Dasen and Mishra, 2010).

Sociotopography seeks to understand this complex interplay of factors in shaping representations of space (Lum et al., 2022; Palmer et al., 2018a,b, 2017). It proposes that environment and language both play a role in shaping conceptualizations, but neither is deterministic, and the influences are multidirectional. Spatial behaviour, both linguistic and non-linguistic, results from the complex interaction of factors of all types, from perceptually salient topography and affordances of that topography, through sociocultural practices and cultural associations assigned to aspects of the landscape, to the nature of each person's individual engagement with their physical environment. Culture is embedded in landscape, and landscape is permeated with cultural knowledge, to the extent that it is construed in diverse ways by different communities. Figure 1 shows key interactions and relationships in the existing Sociotopographic Model (STM) as developed so far, prior to the integration of conceptual representations.

Environment and culture interact as follows. The environment (terrain, topography) shapes culture, through affordances, and individual and shared experiences of interaction with the environment. Conversely, cultural practices shape the environment, through settlement patterns, the built environment, modification of terrain with gardens, farmland, hill terracing for rice cultivation, irrigation channels, land reclamation, etc.

Culture and language use interact as follows. Cultural concerns, practices and beliefs shape language use by prompting use of the available linguistic resources that most effectively express those concerns, practices, and beliefs. Language use in turn shapes culture through the choice of linguistic expression, and frequency with which particular expressions are deployed, drawing speakers' attention to those aspects of culture and the environment that they express.

Finally, language use interacts with the linguistic repertoire itself. The lexical and grammatical resources of a language shape language use by providing its speakers with the resources for expression. However, over time language use also shapes the lexical and grammatical resources available in a language through the conventionalization of frequently used and effective expressions, and the abandonment of unused forms.

3 Landscape and Place – Conceptual Representations of the World

Sociotopography recognizes four levels to the environment, in part inspired by notions employed in ethnophysiography, an approach to the study of human conceptualization of landscape and landscape features (Mark and Turk, 2003, 2016; Turk, 2016, 2020; Turk et al., 2011). Ethnophysiography principally distinguishes between 'terrain' (raw land forms, ecology, climate, etc.) and 'landscape' (a

human construct of relationships with terrain). It excludes consideration of the built environment, but includes toponyms, so includes landscape as place (Mark and Turk, 2016; Turk, 2020, p. 45f).

From the perspective of sociotopography, aspects of the physical world resulting from human activity (the built environment, settlement patterns, modification of the terrain, etc.) are as much part of the environment with which humans interact as the natural terrain. In early work on ethnophysiography (Mark and Turk, 2003; Turk et al., 2011), the term 'topography' was used to refer to what they subsequently defined as 'terrain'. Turk (2016) explains this terminological shift as due in part to 'topography' incorporating 'artificial ('man-made') features' (p. 374)[1], in the context of ethnophysiography's initial focus on 'the physical shape and texture of land, including vegetation, at landscape scales' in this complex area of research (Turk, 2016, p. 369). The distinction between the raw physical world and the environment modified by human activity is important and is recognized in sociotopography, even though the boundary between the two is fuzzy (grasslands resulting from regular burning; hillside terracing for rice cultivation; erosion caused by farming; diverted rivers; reclaimed wetlands; etc.). The environment humans inhabit is in part their own construction, and any attempt to model human interaction with the environment, and the cognitive consequences of that interaction, must incorporate the physical results of human activity. Sociotopography therefore adopts 'terrain' for the raw naturally occurring environment, and 'topography' for terrain plus the effects of human activity. All terrain is topography, but only naturally occurring topography is terrain. Both are aspects of STM's environment module.

Ethnophysiography regards landscape **as** place, because landscape is constructed on the basis of human relationships with terrain. However, landscape and place are not synonymous. The notion of landscape includes landscape categories, such as 'mountain' or 'river', individual instances of which may be places, but the category of which is a class of feature, not an individual instance. In sociotopography, place is defined as a landscape feature or region with an individuated identity. Places are part of landscape, but landscape is a conceptual representation of topography constructed by human relationships with that topography, and places are conceptual entities within that.

Both landscape and place are conceptual representations of the environment. However, the sociotopographic model as developed thus far lacks a component for conceptual representations. So far, the model has focused on the relationship between language and the environment, mediated by sociocultural factors (Lum et al., 2022; Palmer et al., 2018a,b, 2017). It has focused on the bidirectional relationship between topography and culture, the role of language use in mediating between linguistic forms and sociocultural practices, the role of culture and language use in mediating between the language a community uses and the environment in which they live, and so on. The present paper extends the existing model by adding a module for conceptual representations of the environment. Topography is conceptually represented as landscape, and as places within that landscape. The classification of features of the physical environment into landscape categories is a process of constructing a conceptual representation of those features. The notion of landscape proposed here is therefore a conceptual representation of topography (not terrain), and landscape belongs to a module of conceptual representation.[2]

On the basis of the above, the following four levels of environment are employed by sociotopography, including terms adapted from ethnophysiography as outlined above. Each is shown relating to STM's environment or conceptual module:

Environment	
Terrain	raw natural environment (physical shape and texture of landforms, vegetation, ecology, winds, tides, path of the sun, climate, weather, etc.)
Topography	terrain plus human shaping, including artificial constructed features (built environment, settlement patterns, modified terrain, etc.)
Conceptual representations	
Landscape	conceptual representation of topography incorporating the meanings, associations and relationships (physical, utilitarian, social, cultural, spiritual and ethical) that individuals and groups assign to topography
Place	features or regions of landscape assigned individual identity

Terrain and topography interact with culture as shown in Figure 2. Terrain has a unidirectional relationship with culture. Sociocultural practices and structures may respond to terrain, but by definition cannot shape it, as terrain shaped by human activity is topography. Terrain may influence

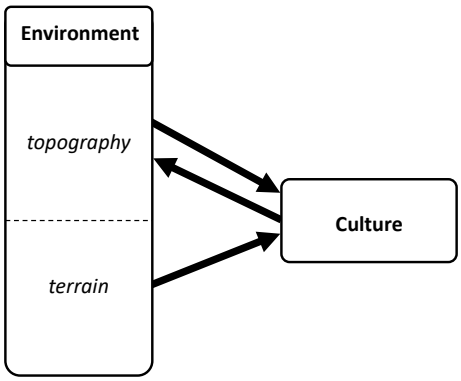

Figure 2: The relationship between terrain and topography and the culture module of STM.

culture, with culture in turn shaping the environment as topography. The relationship between topography and culture is bidirectional, as culture may respond to the modified environment as well as conversely shape it.

4 Landscape, Place, and Language

The forms of expression used to describe landscape and place in a language reveal underlying concepts held by the language's speakers and speaker communities. These include lexicalizations (the semantics of individual terms), and grammatical structures (such as the grammatical behaviour of a specialized class of terms that encode spatial information). It is assumed here that these lexicalizations and grammatical structures reflect conceptual representations of landscape. However, linguistic forms do not merely encode landscape and place in isolation. They reflect their relationship to individual and communal practices, concerns, and beliefs (Turk, 2016, p. 370). Language use also plays a role. Frequency phenomena reflect sociocultural practices, concerns, and beliefs. Terms for important and common practices and prominent concerns and beliefs are used more frequently than those referring to issues of less importance to speakers.

Landscape and place are expressed in several ways in languages. '[L]andscape [...] has deep cognitive underpinnings, and two linguistic manifestation: landform terms, and place names' (Burenhult and Levinson, 2008, p. 139). This omits a third linguistic manifestation: geocentric spatial relational systems (e.g., geomorphic systems such as upriver-downriver axes, landmark-based systems such as mountainward-seaward axes, etc.; see Bohnemeyer et al., 2015; Lum et al., 2022). The three are exemplified by English in (1). This paper is concerned with diversity in landscape language, as context for notions of place. In terms of the linguistic expression of place I follow Mark and Turk (2016, p. 3) in treating toponyms as symbolic references for particular places. In this paper toponyms are treated as a proxy for places.

(1)	a.	*mountain*	landscape
	b.	*Mount Kosciuszko*	place
	c.	*mountainward*	geocentric direction

Considerable cross-linguistic and cross-cultural diversity exists in landscape terminology (Bromhead, 2018; Burenhult, 2008; Mark et al., 2011; van Putten et al., 2020). This diversity in ways of talking about and naming landscape features reflects differing ways of conceptualizing landscape in different language communities and cultures (Turk et al., 2011, p. 36). Turk et al. regard diversity in the **conceptualization** of landscape features as including: ways of cutting up landscape into features (see, e.g., Smith and Mark, 2003); the conceptualization of landscape features as objects versus fields; and the spiritual significance of landscape features (Turk et al., 2011, p. 36). Diversity in the **naming** of landscape features includes: what types of features are given proper names; relationship of toponyms to landscape terms; and the cultural significance of naming practices (Turk et al., 2011, p. 37). The

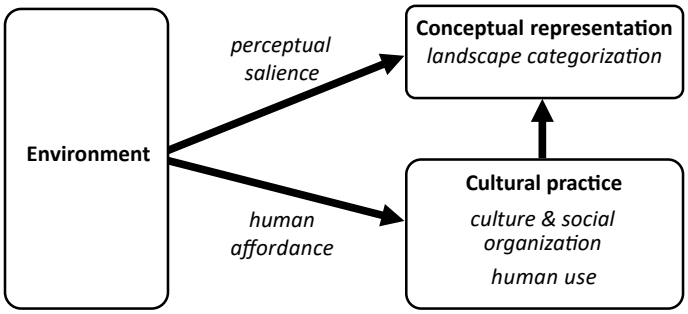

Figure 3: Mark and Turk's motivating factors mapped onto STM's environmental, cultural, and conceptual modules.

Topographic Correspondence Hypothesis (Palmer, 2015) postulates that similar topography will be referred to in similar ways across communities – e.g., languages spoken next to large rivers are predicted to employ an upriver–downriver axis. This presupposes that diverse humans will conceptualize similar topography in uniform ways. The fact that spatial and landscape terminology across and even within language communities varies within similar environments or even the same environment suggests that this is not necessarily the case (Lum, 2018; Lum et al., 2022; Palmer et al., 2017; Schlossberg, 2019). Assuming that the linguistic expression of space and landscape reflects speakers' conceptual representations, this presupposes diversity in the way humans conceptualize landscape.

Mark and Turk recognize three factors motivating landscape categorization: 'perceptual salience, human affordance and use, and culture and social organization' (Mark and Turk, 2016, p. 4f). These fit into an expanded sociotopographic model in several ways. Affordance is a feature of the topography, while human use is a sociocultural response to topography. Affordances in the environment therefore shape sociocultural use. It is the uses that emerge in response to affordances, in the context of other sociocultural practices and beliefs, that in turn shape categorization of landscape as a conceptual representation. In other words, sociocultural practices mediate between environmental affordances and landscape categorization. These interactions are represented in Figure 3.

The way in which perceptual salience influences landscape categorization is less clear and approached tentatively here. On the face of it, categorization motivated by the perception of, e.g., visually prominent features does not seem to be mediated by sociocultural factors, but directly, via perception. This is tentatively assumed to be the case here, but the role of perceptual modalities in mediating between topography and conceptual representations of landscape requires further consideration in the sociotopographic model.

Turk et al. (2011, p. 39–41) identify a set of factors they argue influence the way a language expresses landscape, grouped together as physical environmental factors, social environmental factors, and linguistic factors. These largely align with modules of the sociotopographic model. The STM module of language use is largely absent from Turk et al.'s discussion, as their linguistic factors are largely confined to the resources available in a language for expressing landscape (Turk et al., 2011, p. 41). The role of language use in mediating between the linguistic repertoire on the one hand and sociocultural factors and conceptual representations on the other is not prominent in the ethnophysiographic approach.

Turk et al.'s physical environment correlates to STM's environment module, although their factors encompass only terrain in the sense adopted here, and not also topography, as settlement patterns fall within their social environmental factors. Some aspects of their settlement patterns belong in STM's sociocultural module, e.g., whether settlements are permanent or nomadic, while others involve the effect of sociocultural practices that physically shape the environment, in 'the way in which buildings and/or gardens/fields interact with the natural landscape to produce settled places' (Turk et al., 2011, p. 40). This is because Turk et al.'s factors are grouped in thematic types, whereas bidirectional interfaces between modules are central to the notion of sociotopography: sociocultural practices relating to settlement patterns have a physical effect on the terrain through the built environment and modification of the terrain, resulting in topography as defined here. Their physical environment factors include 'topography' subsequently 'terrain'; (Mark and Turk, 2016; Turk, 2020), climate (including weather), and vegetation, all also belonging in STM's environment module (Turk et al., 2011, p. 40).

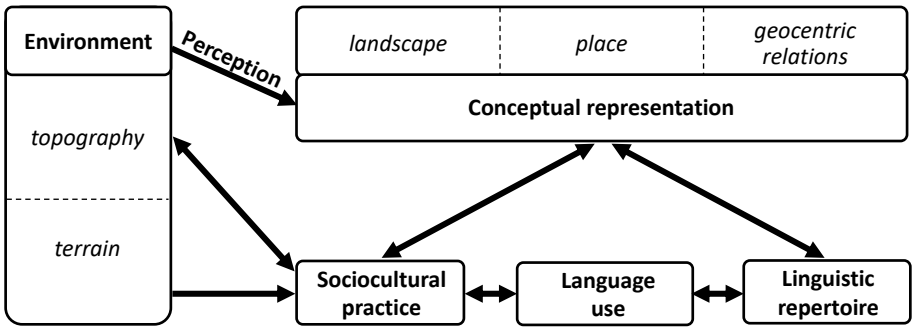

Figure 4: A tentative expanded sociotopographic model. The role, if any, of language use in mediating between linguistic repertoire and conceptual representations is not central to the issues discussed here, and is ignored for the purposes of this diagram.

Their social environment factors largely align with STM's sociocultural module, and include 'lifestyle and traditional economy' (i.e., subsistence mode), settlement patterns (settlement practices, as well as the built environment), religious beliefs or spiritual concerns linked to landscape, and historical factors (Turk et al., 2011, p. 40f).

A number of important differences exist between sociotopography and ethnophysiography. Ethnophysiography is concerned with the role of sociocultural factors in shaping notions of landscape and place. Sociotopography is concerned with the bidirectional relationships that exist between the various factors at stake – environmental, sociocultural, linguistic, and conceptual. Sociotopography is concerned with modelling these relationships, including the relationship between language and environment, language and conceptualization, and environment and conceptualization, and the role of sociocultural factors in mediating in all these relationships. Crucially, while ethnophysiography focuses on the environment as terrain, without the impact of human activity, sociotopography is concerned with human relationships with, and conceptualization of, their entire physical environment, of which the effects of human activity are an inseparable part.

5 Conceptual Representations of Landscape and Place in the Sociotopographic Model

On the basis of the discussion above, a revised sociotopographic model includes conceptual representations of landscape, place, and spatial relations, although spatial relations are not the focus of the present paper. This revised model incorporates notions of terrain, topography, landscape, and place, as defined above. A tentative revised form of the model is outlined in Figure 4.

In addition to shaping conceptual representations of landscape in the form of categorization, as Mark and Turk propose (see Figure 3), sociocultural practices are also shaped by landscape categories and by conceptual representations of individuated places, in a bidirectional relationship. It is assumed here that a similar bidirectional relationship exists between language and conceptual representations. Landscape categories are encoded by lexical items (terms) and by grammatical factors, such as a term's membership of a lexical class of spatial, landscape, or platial terms with specialized grammatical behaviour. Places are encoded by toponyms. In turn, the existence and use of these linguistic resources maintains the landscape categories and places to which they refer. The extent to which this relationship between linguistic repertoire and conceptual representations is mediated by language use is important but not explored further here.

6 Construals of Landscape

Three logical possibilities exist for the role of sociocultural practices and beliefs in shaping conceptual representations of landscape and place. First, the environment shapes sociocultural practices, which in turn shape conceptual representations (sociocultural practices involving interaction with diverse

environments with their own diverse affordances). Second, conceptual representations may be shaped by sociocultural practices and beliefs (social structure, cosmology, etc.) that are assigned to the environment without being motivated by it. Third, conceptual representations may be shaped by environmental features with no apparent analogue in sociocultural practice. These possibilities in motivating conceptual representations may be schematized as in (2), where the arrows represent direction of motivation.

(2)	a.	environment	→	sociocultural practice	→	conceptual representation	Section 6.1
	b.			sociocultural practice	→	conceptual representation	Section 6.2
	c.	environment	→			conceptual representation	Section 6.3

Examples of each are presented below as shown.

6.1 Cultural Practices and Beliefs Motivated by Topography

6.1.1 Cultural Practices Motivated by Topography

Water potability: hydrological terms in Western Pantar. Hydrological terms in the Western Pantar (WP) language of eastern Indonesia (Holton, 2011) provide a useful case study of the environment shaping cultural practices in turn shaping conceptual representations, due to the exception nature of the topography in which WP is spoken: 'the landscape of Pantar is [...] an outlier in the extremes of human habitation' (Holton, 2011, p. 144). Pantar island is volcanic. All surface water is sulfurous and not drinkable, although some is suitable for washing. All subsurface water is contaminated with sulfurous brines to varying degrees (Holton, 2011, p. 145, 160f), in some cases still able to be consumed, with the WP-speaking community having a high tolerance for brines and seawater in their drinking and cooking water (Holton, 2011, p. 160).

Unlike English, WP has no term corresponding to *water*, a superordinate for all the relevant liquid types (Holton, 2011, 158–161). Some naturally occurring liquids in WP can be used for drinking, others are too acidic to drink but can be used for washing, while others are too corrosive even for washing clothes. In addition, seawater is also treated lexically as a separate category. Each of these four types is referred to by a separate term, as in (3), with no lexical superordinate, and may therefore be interpreted as representing separate conceptual categories. Moreover, WP has no terms that refer to bodies of water categorized by shape, such as 'stream' or 'lagoon', or by flow (flowing versus still; Holton, 2011, p. 161). Hydrological classification is therefore determined solely by the affordances of liquid types and the cultural practices that respond to those affordances: WP-speakers drink and wash with *halia*, wash with but do not drink *matá*, and completely avoid *masi*. Holton's description of the situation neatly expresses precisely what the sociotopographic model is attempting to capture: 'landscape classification in WP is driven largely by cultural factors, namely the human experience of landscape and the cultural construction of that experience' (Holton, 2011, p. 144).

(3)	a.	*halia*	water (potable, from any source), body of potable water of any size or shape ('water, spring, well, lake, lagoon, etc.')
	b.	*matá*	acidic supersaline brine (suitable for washing but not drinking)
	c.	*masi*	highly corrosive highly acidic supersaline brine
	d.	*tawá*	seawater

The importance of potability and classification of liquid types is evident in WP notions of place as well as landscape. WP toponyms typically comprise an (exophoric) generic element and a non-generic element (Holton, 2011, p. 150). Of 74 toponyms identified by Holton containing a generic, the largest category contains the generic *habbang* 'village' (24 = 32%). However, the largest category with a terrain generic contains *halia* 'fresh water' (14 = 19%), e.g.: *Halia Bakurang* 'a lagoon at the mouth of the Wassir Valley'; and *Halia Kabbarung* 'a hot spring on beach south of Puntaru village'. *Matá* and *masi* also occur in toponyms, e.g.: *Matá Masigai* 'a sulphurous creek location'; and *Masi Salamang* 'a highly sulphurous creek location'.

In terms of the environmental, sociocultural, and conceptual modules of the sociotopographic model, the WP terrain shapes cultural practice through the functional affordances and effects of physical

contact determining the use to which each liquid type is put. These cultural practices then have a bidirectional relationship with a conceptual representation of landscape. The functional uses to which each liquid type is or is not put, the avoidance of contact with some types, etc., shape and reinforce the conceptual classification of liquid types and bodies of liquid. Conversely, the conceptual classification of liquid types reinforces their differential uses, contact avoidance, etc. Conceptual representations of place are also shaped by cultural practices, as liquid use, contact avoidance, etc., shape characterization of specific locations by liquid type and the uses to which they are put.

Water access: hydrological terms in Yindjibarndi. Issues relating to water use also motivate conceptual representations of landscape and place in the Yindjibarndi language of the Pilbara region of Western Australia (Mark and Turk, 2003; Turk, 2020; Turk et al., 2011), not due to potability, but simply access. Yindjibarndi country is dry. All available water can be drunk, but water is scarce, and awareness of its location is critical. 'There are no permanent or even seasonal rivers or creeks [...] Larger watercourses have running water in them only after major rainfall events [...] Permanent pools occur where [...] the water table [...] break[s] the surface of the ground [...] There are also some small permanent springs and soaks (where water can be obtained by digging)' (Turk et al., 2011, p. 27).

Landscape terms and place names relate to access to water. Unlike Western Pantar, all water is referred to with the Yindjibarndi superordinate term *bawa*. Within this, hydrological classification attends to the affordance of water in terms of its permanence or otherwise, and the flow of watercourses, when they occur, conceptually separating the flowing water itself from the fluvial channel in which it occurs. Terms for bodies of water recognize permanence and means of access, not scale or shape, as in (4). Terms for watercourses distinguish between the flowing water itself, and the fluvial channel in which it occurs. There are therefore no terms comparable to English *river* or *creek* referring to both a channel and the water in it. Terms for channels distinguish shape (5). Terms for flowing water distinguish strength of flow (6), regardless of whether or not the flow is located in an existing channel: a strong flow of water is *mankurdu* regardless of whether or not it is in a river bed, and a trickle of water, even just across rocks during a rare rainstorm, is *yijirdi*.

(4)	a.	*yinda*	permanent body of water of any size (pool, billabong, lake)
	b.	*thurla*	small temporary body of water
	c.	*yurrama*	soak
	d.	*jinbi*	permanent spring
(5)	a.	*wundu*	wide low river bed or channel
	b.	*garga*	narrow deep channel (gully)
(6)	a.	*mankurdu*	strong deep flowing water
	b.	*yijirdi*	slow shallow flowing water, trickle

Cultural practices in obtaining water, driven by the affordances of different water sources, shape the classification of landscape types. However, cultural beliefs in the form of water-focused cosmology are also inherent in the concepts expressed by hydrological terms. All *yinda* are crucial as reliable sources of water, and are highly culturally salient. All permanent bodies of water in Yindjibarndi country are *yinda*, and all *yinda* are places and have toponyms. All *yinda* also have cosmological status: all are occupied by and protected by the water spirit *warlu*. In addition to a functional relationship with *yinda* as a source of water, cultural practices relating to *yinda* involve respect behaviour towards the *warlu*. The term *yinda* includes both functional and cosmological components of meaning: it is a body of water that is permanent and occupied and protected by a *warlu* spirit.

In the sociotopographic model, terrain shapes Yindjibarndi cultural practices in accessing water through the affordances of permanent water sources, whether those sources take the form of a body of water or a spring, or requiring digging, itself requiring knowledge of the locations in the terrain in which to dig. These cultural practices shape conceptual representations of landscape through motivating landscape classification by water source permanence, and for non-permanent water, by still or degrees of flowing. The absence of even seasonal water flow in rivers and creeks motivates a conceptual distinction between a landform through which water flows (in exceptional circumstances), and the nature of the flowing water itself. The salience of permanent bodies of water in cultural practice plays a role in motivating the cosmological status of such bodies as incorporating the presence of a relevant spirit in the conceptual representation of landscape objects of this type. The landscape classification

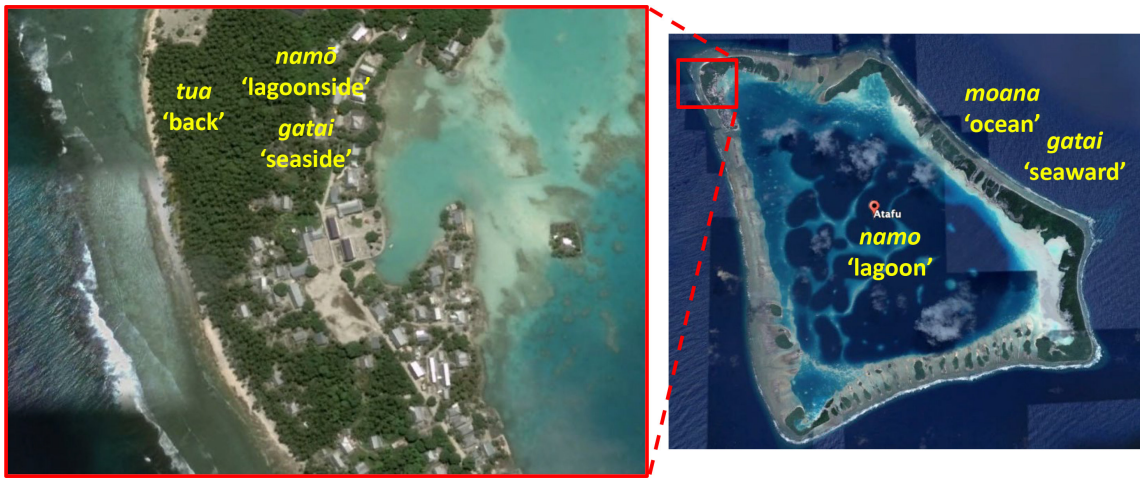

Figure 5: Atafu atoll and village with landscape/place terms mapped.

itself shapes cultural practice by reinforcing knowledge of where to find such sources, where to dig for soaks, etc., and how to behave cosmologically when at bodies of water. Landscape classification and cultural practices and beliefs shape notions of place, through the conceptual representation of all water source locations as places and the assignment of toponyms.

6.1.2 Social Constructs Motivated by Topography

The cosmological dimension of Yindjibarndi hydrological terms involves topography motivating cultural beliefs as well as practices. Complex and comprehensive social structures and cultural belief systems can respond to topography in this way, shaping conceptual representations of landscape and place. Atoll-based languages provide an example. Atoll islands comprise an unusual location for habitation. Strips of land are strung around a large central lagoon. Islands are so narrow that both the central lagoon and the ocean outside the atoll are often visible from a single location. The lagoon side and ocean side of atoll islands differ in highly salient ways and provide distinct affordances (Hoëm, 1993; Lum, 2018, p. 30, 34, 40; Palmer, 2007). The lagoon is typically calm and shallow and the lagoon shore is furnished with sandy beaches, allowing the safe landing and anchoring of boats. The lagoon side of an island is protected from ocean waves and currents and typically sheltered from ocean winds. In contrast, the ocean side of an island is typically rocky and fringed with reef, and cannot be safely approached from the sea. It is exposed to the open ocean seas, currents, and winds. All attested atoll-based languages lexicalize the distinction between the lagoon side and ocean side of an island with distinct terms referring to each (Lum, 2018, p. 180; Palmer, 2007). These are assumed to represent distinct categories of landscape and place. In response to this terrain, cultural practices and beliefs and social structures in atoll-based communities typically incorporate this distinction. This includes maritime and agricultural practices, as well as settlement patterns, with villages and towns built along the lagoon shore, unless they become so large that they spread from the lagoon side across the width of the island. In this bidirectional relationship between the environmental and sociocultural modules of the sociotopographic model, terrain affordances shape cultural practice in the form of settlement patterns, which in turn shape topography through the built environment.

Polynesian Tokelau is typical: 'The orientation of interest and activity in the Tokelauan village is centripetal, toward the lagoon, rather than centrifugal, toward the ocean and the world beyond' (Hoëm, 1993, p. 141). The lagoon side of an island or village is regarded as its front, and the ocean side as its back (Hoëm, 1993, p. 141–143). On land, the lagoon side is referred to either as *namō* 'lagoonside' (from *namo* 'lagoon'; Hooper pers. com.) or *gātai* 'seaward', and the ocean side is referred to as *i tua* 'in the back' (Anon, 1986; Hoëm, 1993; see Figure 5).

Tokelauans tend to 'conceptualise social relationships in concrete spatial terms' (Hoëm, 1993, p. 138), and the front-back dichotomy is a key element of this. The front of an island is regarded as moral and under social control, while the back is uncontrolled, wild, and dangerous, where 'danger lurks' and one is vulnerable to attacks by spirits and ghosts (Hoëm, 1993, p. 141–143), correlating with the

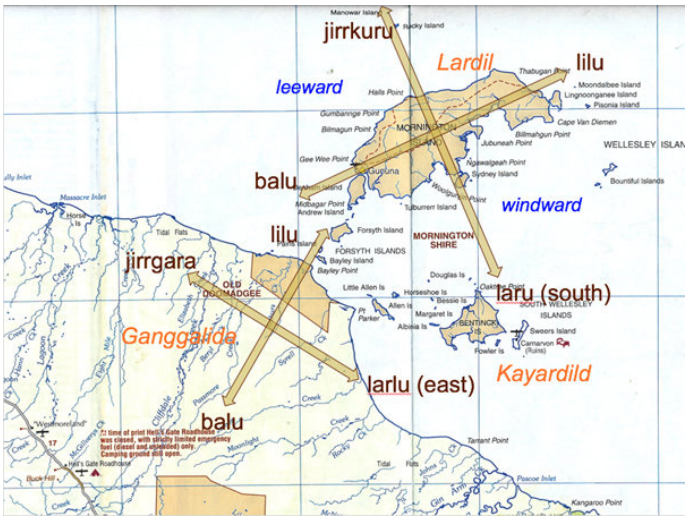

Figure 6: Mornington Island showing windward and leeward sides, with directional terms in Lardil and the Ganggalida language of the adjacent mainland also mapped showing skewing to wind direction.[3]Map and data courtesy of Cassy Nancarrow.

sheltered topography of the lagoon side and exposed topography of the ocean side. This correlates with a broader social alignment in Tokelauan society between the notion of front associated with appropriate personal behaviour and conformity to social expectations and the notion of back associated with the opposite. In the settled, inhabited front of an island, controlled, dignified, quiet behaviour is expected. At the back of an island such behaviour cannot be relied on.

In the sociotopographic model, the terrain affordances and settlement patterns in the built topography shape cultural practices, social structures, and societal values and mores. These sociocultural forms interact bidirectionally with conceptual representations of landscape and place, shaping landscape categories and notions of place associated with the lagoon and ocean sides, with distinct notions of each side as landscape categories and as places reinforcing cultural practices and social behaviour and expectations.

6.2 Sociocultural Correlates of Topography with No Obvious Environmental Motivation

In Section 6.1, cultural practices and beliefs and social systems that underpin aspects of landscape classification and place are motivated by the nature of the topography and its affordances. Sociocultural forms may also be assigned to aspects of topography without any apparent motivating factor. In other words, sociocultural forms may be arbitrarily mapped onto topographic distinctions. Aspects of the social structure of the Lardil community of Mornington Island, in Australia's Gulf of Carpentaria, provide an example. The highest level Lardil social structural division reflects a topographic opposition – the leeward and windward sides of Mornington Island, with no evident environmental motivation other than simply the existence of that topographic distinction.

Mornington is an island about 65 kilometres in length, oriented roughly southwest to northeast in cardinal terms. For most of the year the prevailing winds are from the southeast to the northwest, roughly corresponding to the line of coast in the southern Gulf of Carpentaria, with winds from the northwest prevalent during the wet season from January to March (Rosendahl, 2012, p. 60; see Figure 6). For most of the year, the long southeastern side is windward, and the northwestern side is the lee side. This distinction between the southeastern windward and northwestern leeward sides is represented conceptually in landscape and in place, and corresponds to key Lardil social structure and cosmology.

Lardil society is organized on the basis of a complex exhaustive kinship system, and on the basis of clans associated with 31 clan estates (*Country*) around the island (McKnight, 1999, p. 81–107). These estates are distributed across four cardinal regions: the northeastern and southwestern ends of the

island and their adjacent smaller islands, the southeastern windward side, and the northwestern leeward side (McKnight, 1999, p. 111–113). Individuals belong to their clan estate, and their cardinal region. However, the strongest social group identity is based on two moieties: the Windward Moiety and the Leeward Moiety, associated with the southeastern and northwestern sides of the island respectively (McKnight, 1999, p. 113; Memmott, 1979, p. 79–84; Rosendahl, 2012, p. 54). All clan estates are associated with the Windward and Leeward regions, and all Lardil individuals belong to one of the two associated moieties. This socio-geographic bifurcation corresponds largely but not entirely to cardinal regions. The southeastern and northwestern regions belong to the Windward and Leeward Moieties respectively. However, the northeastern and southwestern regions are distributed across the two moieties, with most northeastern people belonging to the Leeward Moiety and most southwestern people belonging to the Windward Moiety (McKnight, 1999, p. 113).

The social distinction between Windward and Leeward people is highly prominent in traditional Lardil cultural practice and cosmology. The division of Lardil society into these two moieties was manifest in inter-group conflict, and in the competitive dancing displays that are a key feature of traditional Lardil culture (McKnight, 1999, p. 8, 113). Fighting between groups of opposing moiety members remained common at least until recently, and children played and fought along moiety lines (McKnight, 1999, p. 113). Groups from each moiety competed in displays of dancing, and each moiety maintained its own dancing ground, even in the main settlement on the island that resulted from colonization.

The distinction is manifest in Lardil cosmology. Of the three Lardil creation ancestors, one travelled along the leeward side, while the other two travelled along the windward side, naming the places on their respective sides as they went (McKnight, 1999, p. 53f; Memmott et al., 2006, p. 38). The windward ancestors built fish traps as they went, while the leeward ancestor speared fish from sandbars, corresponding to cultural practice, with fish traps much more prevalent in the archaeological record on the windward side than the leeward side (McKnight, 1999, p. 79; Rosendahl, 2012, p. 58). A dispute arose between one of the windward ancestor beings and the leeward ancestor being, resulting in the windward ancestor killing the leeward ancestor, explaining the origin of death (McKnight, 1999, p. 78f), corresponding to the traditional competition and open conflict between the moieties.

The most salient topographic distinction on Mornington Island is between the windward and leeward sides. The principal sociocultural distinction is mapped onto this topographic distinction. However, there is no evident motivation in any topographic difference between the two sides that corresponds to any sociocultural features of the two moieties. It appears that the topographic difference between the windward and leeward sides of Mornington simply provides a useful environmental distinction onto which to map the principle distinction in sociocultural practice and beliefs, underpinning the conceptual categorization of landscape into leeward and windward categories, and those regions and associated *countries* into windward and leeward places.

6.3 Landscape Categorization with No Obvious Interactional or Sociocultural Motivation

Among the Lardil, certain cultural practices and social structure along with landscape categories and notions of place map onto a topographic dichotomy, but the motivation comes from within sociocultural structures, not the topography itself. The corollary to this lies in topography motivating landscape categorization directly, without the mediation of sociocultural factors. The role of shape in categorizing landscape among Manyjilyjarra speakers appears to exemplify this (Hill, 2022; Hill and Turk, 2016; Turk, 2020, p. 309–354; Walsh, 2008). In the Indigenous Manyjilyjarra language, spoken in Western Australia's Pilbara region, scale plays no role in landscape categorization. Instead, two factors play a role in the classification of landscape features: material composition, and shape.

Of these, material composition has an interactional dimension in affordances and interaction with different ground types. Manyjilyjarra speakers make a pervasive contrast between ground that is *runyu* 'soft' and that which is *nantirr* 'hard', and classify landscape types and places as regions of hard or soft ground (Hill, 2022), a distinction common in hunter-gatherer societies (see, e.g., ǂAkhoe Hai‖om, Namibia; Widlok, 1997, p. 320f, 327; Widlok, 2008, p. 366f). Hard and soft ground have crucial differences in their affordances. They are the locus of different biosphere (e.g., useful plants and animals). They have different potential for water containment (hard ground types retain water after

rain, soft ground types do not); and in ease of tracking and hunting (it is easier to track game across soft ground types, and more difficult across hard ground; Hill, 2022; Walsh, 2008, p. 254). However, the role of shape as a categorizing basis for landscape has no apparent analogue in affordances or other interactional factors. It appears to reflect attention to shape rather than scale in landscape categorization, with no specific correspondence in cultural practice.

Some Manyjilyjarra landscape categories reflect material, others reflect shape, others correspond to both. For no category is scale a factor in the distinctions that are encoded. The Manyjilyjarra landscape dictionary contains around 120 terms (Hill and Turk, 2016). Some key terms are shown in (7)–(10). Broadly, a key distinction is encoded between convex and concave topographic structures. The terms in (7) encode only shape, distinguishing raised or convex forms from concave forms, natural or artificial, of any size (Figure 7). Other landscape terms encode only material. For example, *yapu* (8) encodes any object of any scale made of rock, from rocky mountains to small stones on a path (Figure 8). Others encode both shape and material (9), encoding landscape forms of any size of the requisite soft material and round or elongated shape (Figure 9). The same neutral encoding with relation to scale applies water features, with terms encoding shape, material, water-holding potential, and water flow (10).

(7)	a.	*warrarta*	raised area of any size, natural or artificial (hill, plateau, crest in road, bank of river, roof of building, top of table)
	b.	*takurru*	any concave form, natural or artificial (valley, gully, dip, divot or hollow in landscape, pipe, satellite dish, bowl; Figure 7)
(8)		*yapu*	rock (mountain, rock hill, outcrop, rock, pebble, coin; Figure 8)
(9)	a.	*tumun*	rounded elevated shape comprised largely of sand or earth of any size, convex rounded form of sand or earth (large hill, ants nest, etc.; Figure 9)
	b.	*yintiri*	elongated convex form of sand (sandridge kilometres long, small sand-bank that can be stepped over)
(10)	a.	*wirrkuja*	concave form in rock capable of holding still water (large permanent rockhole suitable for swimming, small crevice in rock capable of briefly holding water after rain, etc.)
	b.	*karru*	watercourse, channel, depression of any size where water can flow

Numerous other terms encode shape without consideration of scale. *Jiwarlykarra*, e.g., encodes shape and material: a rock face, vertical or horizontal, of any size from a towering cliff to the surface of a stone embedded in the ground. *Larrku* encodes just shape: a slope of any size or degree of steepness, from the side of a sandridge to a rocky hillside or edge of a lake to the embankment at the side of a road to a roofline. The lack of encoding of scale is pervasive throughout Manyjilyjarra landscape terminology.

The importance of shape without any reference to scale in Manyjilyjarra appears to be an instance of landscape categorization responding to topography without the mediation of sociocultural practices or structures. While the material compositional differences between a hill that is *yapu* and one that is *tumun* provide different affordances, the shape of a *yapu* or *tumun* do not: it is not apparent what affordances could be shared by a rocky mountain and a stone on a path, or by an earth hill and an ant mound. No Manyjilyjarra cultural practices appear to treat all instances of *tumun* alike, for example. The shape element of this landscape concept appears to be motivated by topographic form alone, accessed directly via perceptual modalities. For terms such as *warrarta* and *takurru*, the sole topographic motivation appears to be direct. In the sociotopographic model, this involves a unidirectional interaction between topography and the conceptual representation of landscape. How perception as the means of this interaction fits into the model remains to be considered.

It is noteworthy, however, that although shape and material are the bases for landscape categorization in Manyjilyjarra, they play no role in notions of place encoded in toponyms. These are assigned solely on basis of affordance and cosmology. The crucial affordance factor relates to reliable access to water. A *yinta* is a permanent source of water of any type, including soaks, springs, rockpools, and lakes. Every *yinta* is a place for Manyjilyjarra speakers, and almost all have a toponym (Hill pers. com.; Turk, 2020, p. 325f). However, as in Yindjibarndi (Section 6.1.1), all *yinta* have also cosmological status: all include a range of spiritual associations (*jukurrpa*), including the presence of a creation being, and the term and places identified as instances of *yinta* include both the utilitarian and spiritual

Figure 7: Examples of takurru: valley (left); corrugation in road (right). Photos courtesy of Clair Hill.

Figure 8: Examples of yapu: rocky mountain visible for kilometres (left); stone on dirt track (right). Photos courtesy of Clair Hill.

Figure 9: Examples of tumun: rounded earth hill (left); small mound of ants' nest (right). Photos from Hill and Turk (2016) with permission.

elements. The few named places that are not *yinta* appear to all refer to locations of *jukurrpa* sites where ancestral beings transformed or were transformed by landscape. Although shape is central to conceptual representations of landscape, it is not an component of place in Manyjilyjarra, either in toponyms or the individuated landscape entities they refer to. This raises the intriguing general possibility that although concepts of landscape may respond to perceptually accessed topography without corresponding sociocultural practices and structures, the same is not true of concepts of place, which, as individuated conceptual entities with which humans interact, are always associated with sociocultural practices and structures. This is a hypothesis that warrants further empirical investigation.

7 Conclusion

Sociotopography recognizes that humans' physical environment includes terrain (raw landforms, natural vegetation, climate, wind, etc.), and the effects on terrain of human activity (built environment, settlement patterns, modification of the terrain, etc.). Terrain and human impact on it together comprise topography. Humans construct conceptual representations of the environment in the form of landscape categories, places, and geocentric directions. These conceptual representations are encoded in linguistic terms and structures, and are in turn shaped and reinforced by language. They interact with sociocultural practices, structures and beliefs, being motivated by, and in turn shaping and reinforcing those sociocultural forms. And they interact with terrain and topography itself, via sociocultural forms that respond to the affordances and other interactional aspects of the environment, and directly via perceptual modalities.

Notes

1. Turk also notes that 'topography' can refer to the study and/or mapping of land (Turk, 2016, p. 374). The term does not have this sense in sociotopography.
2. Landscape is therefore understood as a representation of topography, i.e., including the impact of human activity, and not merely of the unimpacted world of terrain, a relationship neatly captured in the European Landscape Convention definition of landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human forces' (Council of Europe, 2000).
3. The salience of prevailing winds is also manifest in Lardil directional terms, shown in Figure 6. The wind and coast-based nature of the terms is evident in the skewing with cognate terms in Ganggalida on the adjacent mainland coast. *Laru*/*larlu* and *jirrkuru*/*jirrgara* encode windward and leeward directions respectively, although they are typically translated as south and north for Lardil and east and west for Ganggalida, with corresponding translational shift for *balu* and *lilu* (Nancarrow, 2014, pers. com.; Ngakulmungan Kangka Leman (Language Projects Steering Committee), 1996; Tindale, 1974, p. 45). *Laru*/*larlu* encodes direction towards the prevailing wind southeast from the windward side of Mornington or southeast along the coast in Ganggilida, with *jirrkuru*/*jirrgara* encoding the direction leeward from the leeside of Mornington or along the mainland coast leeward. The skewing tied to winds means, e.g., that *larlu* is translated as east for Ganggilida, but south for Lardil, and while the sun is described as rising *lilu* and setting *balu* in Lardil, it rises *larlu* and sets *jirrgara* in Ganggilida. The consistent geocentric correlate to the terms is wind direction.

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ORCID

Bill Palmer https://orcid.org/0000-0003-4554-1225

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