



Desertification is a prisoner of history: An essay on why young scientists should care

James F. Reynolds^{1,*}

(1) Nicholas School of the Environment and Earth Sciences and Department of Biology, Duke University, Durham, NC 27708, USA

* Autor de correspondencia: James F. Reynolds [james.f.reynolds@duke.edu]

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Desertification is a prisoner of history: An essay on why young scientists should care

Abstract: Since its origins, the concept of desertification has been shrouded in controversy and ambiguity. As a result, no single definition of the term has been acceptable; there is no agreement on its extent or seriousness; and the solutions proposed are often disparate and counterproductive. This essay suggests all of this is due to the concept of desertification being a permanent 'prisoner of history', a historical process led by the United Nations Convention to Combat Desertification (UNCCD). In this essay, I describe why the prisoner of history narrative applies to the concept of desertification. To do this, I review the historical events that built a metaphorical prison for desertification; show why definitions of the term 'desertification' are products of this prison; describe how so much misunderstanding and confusion in this field has led to real, negative consequences; and lastly, provide recommendations to young scientists as to how to avoid becoming incarcerated in this prison.

Keywords: UNCCD; land degradation; desertification; definition; history

La desertificación es prisionera de la historia: Un ensayo sobre por qué los jóvenes científicos deberían preocuparse

Resumen: Desde sus orígenes, el concepto de desertificación ha estado rodeado de controversia y ambigüedad. Como consecuencia, no hay una única definición del término que sea aceptable; no hay acuerdo sobre su alcance o gravedad; y las soluciones propuestas son a menudo dispares y contraproducentes. Este ensayo sugiere que todo esto se debe a que el concepto de desertificación es un "prisionero permanente de la historia", un proceso histórico dirigido por la Convención de las Naciones Unidas de Lucha contra la Desertificación (CNUCLD). En este ensayo, describo por qué la narrativa del prisionero de la historia se aplica al concepto de desertificación. Para ello, repaso los acontecimientos históricos que construyeron una prisión metafórica para la desertificación; muestro por qué las definiciones del término "desertificación" son producto de esta prisión; describo cómo los numerosos malentendidos y confusiones en este campo han provocado consecuencias reales y negativas; y, por último, ofrezco recomendaciones a los jóvenes científicos sobre cómo evitar ser encarcelados en esta prisión.

Palabras clave: CNUCLD; degradación de tierras; desertificación; definición; historia

Introduction

An evening in the pub with Paula (see [Table 1](#) for keys)

A group of attendees of a UN conference to combat desertification walk into a pub. As they're placing drink orders, their server, a local student named Paula, notices their name tags and politely asks, "So, what exactly is desertification?" An ecologist answers, "Simple, it's brush encroachment of semiarid grasslands, which leads to soil erosion and loss of productivity."^a To which someone adds, "However, if it results in an increase in productivity we call it 'green desertification!'"^b A scientific affairs officer counters, "Interesting, but isn't desertification the process of turning fertile agricultural lands in drylands into deserts?"^c Puzzled, a political delegate asks, "Only drylands?"^d Today, I heard a talk about desertification in Iceland!"^e Someone immediately says, "Land degradation can occur anywhere but when it occurs in drylands it's called desertification."^f A geographer injects, "Well, desertification in the Sudanian zone of Africa is called 'sahelisation' because the encroaching plant species

are from the Sahel."^g An agronomist says, "Perhaps it's easiest to think of desertification as a type of soil degradation, for example, compaction and salinization."^h To which a soil scientist responds, "Exactly! In the Ukraine, soil degradation is 38% compaction and 4% salinization," but following a brief pause, adds "and it's also 0.2% desertification."ⁱ A botanist says, "In northern China, desertification is the primary form of land degradation since it causes soil degradation."^j Lastly, a sociologist asserts, "Well, don't forget desertification can cause poverty, and poverty can cause further desertification."^k Paula stood motionless, bemused and puzzled by the chorus of answers. The debate she invertedly started persevered into the evening, with lively back-and-forth banter between the attendees about their work and views on desertification. Paula overheard statements such as, "Rocky desertification is turning karst areas into rocky landscapes"; "The 'desertification of development' has pushed Las Vegas to its limits of sustainability"^m; "The ecological degradation of karst desertification is characterized by loss of cultivated soils"ⁿ; "We're combating aeolian desertification, which is land degradation caused by wind erosion"^o; "We're combating

sandy desertification, which is land degradation caused by wind erosion”^p; “In tundra areas, permafrost thaw can lead to desertification”^q; “Desertification protects the permafrost in an alpine mountain zone”^r; and “Forest species guard against desertification by providing multiple ecosystem services.”^s Later, as the attendees filed out of the pub, Paula wondered, “How can they have a conference about a topic like that?” She smiled as she eyed a long-forgotten, faded Mark Twain quote framed on the wall near the pub’s exit, which was the perfect description of her night:

The more you explain it, the more I don't understand it.
Mark Twain (writer and humorist)

Table 1. Key to citations in “An evening in the pub with Paula.” This fictitious dialogue does not represent the work or views of any specific person or research group. Links to these citations are intended as examples of the myriad of uses (and applications) of the term ‘desertification’ that exist in the literature.

Tabla 1. Clave de las citas en “Una noche en el pub con Paula.” Este diálogo ficticio no representa el trabajo o las opiniones de ninguna persona o grupo de investigación específico. Los enlaces a estas citas pretenden ser ejemplos de la miríada de usos (y aplicaciones) del término “desertificación” que existen en la literatura.

Key	Reference
a	Grover and Musick (1990)
b	Herrmann et al. (2014)
c	Saier (2010)
d	Mirzabaev et al. (2019)
e	Aradóttir et al. (2013)
f	Montanarella et al. (2018)
g	Wittig et al. (2007)
h	Khanamani et al. (2017)
i	FAO and ITPS (2015)
j	An et al. (2019)
k	IFAD (2010)
l	Wang et al. (2004a)
m	Luke (2020)
n	Tang et al. (2019)
o	Wang et al. (2015)
p	Wang et al. (2004b)
q	Xue et al. (2009)
r	Xie et al. (2015)
s	Gonzalez (2001)

Desertification as a prisoner of history

In 2009, I presented a keynote address at the first Scientific Conference on ‘Understanding Desertification and Land Degradation Trends,’ at COP9 of The United Nations Convention to Combat Desertification (UNCCD). This conference was a pioneering effort to improve the flow of scientific knowledge into the Convention’s processes by engaging the scientific community “to an extent and intensity unmatched in the history of the Convention” (Winslow et al. 2011). My presentation, which represented several years’ effort by Working Group 1 (WK1) of the Dryland Science for Development consortium, outlined the details of an integrated, science-based framework for monitoring and assessing desertification, including a new, innovative global monitoring system. While my talk generated considerable discussion (described as a “lively debate” by Winslow et al. 2011), it largely focused on delegates challenging how WK1’s definitions of land degradation and desertification were different from “the official UNCCD definitions”! Like Paula, I stood motionless, bemused and puzzled. It was at this moment I realized that

the concept of desertification – and its accompanying features – was a **permanent** prisoner of history.

When an institution, business, or individual is faced with new ideas or unique challenges – but their responses are constrained by rules, traditions (“we’ve always done it this way”), attitudes and so forth – they are considered ‘prisoners of history’, unable to adapt to change. In this essay, I describe why the prisoner of history narrative applies to the concept of desertification. To do this, I review events that built a metaphorical prison for desertification; show why definitions of the term ‘desertification’ are products of this prison; describe how so much misunderstanding and confusion in this field has led to real, negative consequences; and lastly, provide recommendations to young scientists as to how to avoid becoming incarcerated in this prison.

Custodial History of desertification

How the prison was built

Blueprints for construction of the metaphorical desertification prison can be traced to three unique, but interwoven, events: (1) The colonial period (1929-1930s); (2) the Sahel crisis (1970s); and (3) the Earth Summit (1992-1996).

In the 1920s-1930s during colonial rule in West Africa, Anglo-French bureaucrats and scientists were concerned about the drying-out (desiccation) of forests in their territories. They blamed indigenous nomads for the ‘creation of deserts’ due to overgrazing, over-population, mismanagement, and deforestation. The term ‘desertification’ was coined to depict human culpability in creating these deserts and the popular press was drawn to melodramatic reports about the “encroaching Sahara” due to a “vicious cycle of desertification caused by humans” (Reynolds 2013). Erratic rainfall in the Sahel – a natural feature of all drylands – was portrayed to be the direct consequence of ‘desertification’ (Slegers and Stroosnijder 2008). However, it has been well-established that this catastrophic, man-made desertification crisis in the Sahel never actually happened (see Davis 2004; Mortimore 2016; Cherlet et al. 2018).

In the 1970s a decade-long drought and widespread famine in the Sahel led to the second prison-building event. The global response to this tragedy was led by the United Nations (UN), which convened a Conference on Desertification (UNCOD) in 1977. Although wet weather had returned to the area by the 1940s (thus calming down the international fury about encroaching deserts, Le Houérou 1996), the term ‘desertification’ was selected by the UN Environment Programme (UNEP). This added a human cause to climatic variation, thereby launching a highly political process (Grainger 2010). Delegates were told that “desertification is the result of land abuse” (Garduno 1977, cited in Rhodes 1991), which reinforced the premise that desertification was caused by indigenous populations who practiced unwise, irrational, and unsustainable land use methods. These ideas were crafted into the first official UN definition of desertification (Dregne 1986; Mainguet 2003): ‘the diminution or destruction of the biological potential of land, and can lead ultimately to desert-like conditions.’

The last of the three events took place in Rio de Janeiro in 1992 where a second desertification conference was held in conjunction with the Earth Summit. A politically-laden agenda linking desertification to poverty, recurring drought, and food insecurity was driven mainly by African states (Bauer and Stringer 2009). Ultimately, a legally-binding international convention was ratified (in 1996), which is the present-day UNCCD (1994). Its stated goal is to ‘combat desertification and mitigate the effects of drought, particularly in Africa.’

These three prison-building events are highly interlinked. Davis (2016) documents how the ideas and philosophy of the colonial experts formed the basis of UNESCO’s Arid Zone Program (1950s), which in turn provided the background for the UNCOD (1977), and then for the UNCCD (1994). One of the most lasting impacts of these events is that both the **concept** of desertification’ and its **definition** were institutionalized and enshrined by the UNCCD.

How wardens of the prison enshrined a definition

The UNCCD needed a revised definition of desertification following the Rio meetings. After protracted negotiations, which involved dropping the colonial-era crisis narratives of “the expanding Sahara” and insistence of human causation, and equating drought with permanent land degradation (Behnke and Mortimore 2016b), the following consensus definition was adopted:

‘land degradation in arid, semi-arid and dry sub-humid areas, resulting from various factors, including climatic variations and human activities,’

where land degradation is the ‘the reduction or loss of biological or economic productivity’ (UNCCD 1994).

The adoption of this definition was a **milestone** event, marking an important step in the process of how desertification is currently viewed. In a sense, this definition became an “inmate” of the

metaphorical prison: that is, the “institutionalization of desertification within the UN system” (Behnke and Mortimore 2016b) effectively creating an “international regime ... centered around the UNCCD” (Bauer and Stringer 2009). It is commonly acknowledged that the definition of desertification has more or less been **enshrined** (preserved, protected, authoritative) by the UNCCD (e.g., Reynolds et al. 2007; Verstraete et al. 2009; Stafford Smith 2016; ECA 2018; Burrell et al. 2020).

Is there an acceptable alternative to the UNCCD definition? As shown in **Table 2**, the answer is no! Does this mean the UNCCD definition is universally accepted? The answer is somewhat nuanced (see below) but I found that even in a cursory examination of the research literature, the UNCCD definition is frequently used (a Google Scholar search returned nearly 9K papers published between 1994–2020 that cite some form of this definition; see **Table 3**).

Table 2. Selected critiques of the definition of desertification over the past 50 years. (NOTE: edits for clarity are shown in italicized text enclosed by parentheses).

Tabla 2. Selección de críticas a la definición de desertificación en los últimos 50 años. (NOTA: las modificaciones para mayor claridad se muestran en el texto en cursiva entre paréntesis).

Decade	Statements	Source
1970s	“The International Geographical Union’s Working Group on Desertification meeting recently ... spent an unconscionably long time attempting definitions that would satisfy the geographers, and finally, in a burst of exasperation, asked us why we should not call it aridization, or any number of other awkward and unpronounceable terms!”	Paylore 1975
	“... problems associated with achieving even a common definition of the phenomenon have been legion.”	Johnson 1977
	“... (A) rigorous definition is impossible.”	Grove 1977
	“The term desertification has been misused for decades ...”	Le Houérou 1977
1980s	“In fact, if there is one thing most authors will agree upon, it is to recognize that there is no general agreement on the meaning, nature, and extent of desertification.”	Verstraete 1983
	“... there is no generally accepted definition of desertification.”	Dregne 1986
	“This paper is based on a review of more than one hundred definitions of desertification taken from the literature. ... (it shows) a great diversity (and confusion) among definitions ...”	Glantz and Orlovsky 1987
	“... basic misconception results from the use of the ill-defined term ‘desertification.’”	El-Baz 1988
1990s	“Everyone generally knows (what desertification is) but objective scientific definition is elusive.”	Spooner 1989
	“Over the years the definition of desertification has moved from ‘the expansion of desert-like conditions’ to ‘a process of sustained land (soil and vegetation) degradation’”	Binns 1990
	“An all- agreed definition is not available on the evolving concept of desertification, and the concept has been defined in many different ways by scientific and policy communities.”	Rhodes 1991
	“Desertification, as well as land degradation, has different meanings for different people and a variety of definitions and concepts of desertification and land degradation exist.”	Hellén 1991
2000s	“But no satisfactory evaluation system (exists due to several factors, including) multiple definitions of the desertification concept, ...”	Rubio and Bochet 1998
	“Desertification ... (is) difficult to precisely define... “	Mainguet and Da Silva 1998
	“This plethora of definitions might give the impression that (desertification) is well-understood, but that is a myth. In reality, it hides a lack of knowledge of what it is.”	Smith and Koala 2003
	“Most definitions of desertification ... vary according to the judgment and expertise of the researchers involved.”	Nasr 2004
2010s	“The vagueness of the definition of what ‘desertification’ constitutes allows for different interpretations ... ”	Juntti and Wilson 2005
	“During the last 70 years, conflicting definitions have produced both different assessment methodologies and divergent estimates.”	Verón et al. 2006
	“Poor definitions mean that researchers may make differing measurements, giving false pictures and making it easier for agencies and policy-makers to argue whether to fund countermeasures.”	Barrow 2009
	“...the never ending debate on the definition of desertification makes it an even harder challenge (to map land degradation and desertification).”	Zucca et al. 2012
2020s	“Desertification is a controversial term even the authors of this paper disagreed about what it should mean.”	Bestelmeyer et al. 2015
	“... there are a plethora of broad, but non-specific definitions ...”	Prince 2016
	“... a lot of debate has arisen about the definition of desertification, its causes, the severity, the global occurrence of desertification, and the impacts it has on the dryland populations.”	Sterk and Stoorvogel 2020
2020s	“There is no universally agreed upon definition of desertification.”	Burrell et al. 2020
	“The lack of a clear definition and of standardized techniques for measuring the causes and consequences of desertification has resulted in the use of different estimation techniques for determining the location, extension, and conditions of desertification.”	Becerril-Piña and Mastachi-Loza 2021

Table 3. A Google Scholar search of the literature for the UNCCD definition of desertification.**Tabla 3.** Una búsqueda en Google Scholar de la literatura para la definición de desertificación de la CNULD.

Parameter	Definition/result
Search Query:	Desertification AND (define OR definition) AND (UNCCD OR CCD) <i>Note: Various search queries were attempted in order to return documents that cited the UNCCD definition. This combination was most successful.</i>
Results:	8.9 K articles
Constraints:	Dates: 1994-2020 OFF: include citations Sort: By relevance
Date of search	25/06/2021
Comment	This is likely an overestimate but in a spot-check of the first 60 documents returned, all cited the UNCCD definition (in some manner). Of course, this search will miss papers who use the definition (directly or paraphrased) but do not cite the UNCCD.

Critique of UNCCD's definition

The UNCCD definition has been criticized for many reasons by the research community. Behnke and Mortimore (2016b) posited that the “official definition was sufficiently vague to encompass all kinds of environmental decline ... by almost any imaginable cause.” There was inherent confusion with the definition due to disagreements about its root causes (how to separate natural- from human-induced), its characteristics and duration (short- vs. long-term); its restriction to drylands; how to quantify and its consequences (reversible or not?) (Dodd 1994; Mainguet and Da Silva 1998; Reynolds and Stafford Smith 2002; Verstraete et al. 2009; Mortimore 2016; Safriel 2017); and what (and how) to map its extent (Cherlet et al. 2018; Prince 2019). It was argued that the definition “formalized the ambiguous roles of environmental degradation and drought” (Grainger 2009).

At the core of these criticisms is what constitutes land degradation? Land degradation is defined in many different ways within the literature, with differing emphases on biodiversity, ecosystem functions and ecosystem services (Olsson et al. 2019). Degradation is a relative condition so it can only be measured by comparison to a reference state, which is rarely known (Bestelmeyer et al. 2015; Prince 2019) and can only be judged in the context of its spatial, temporal, economic and cultural setting (Reynolds and Stafford Smith 2002; Warren 2002; Sonneveld and Dent 2007). Hence, land degradation is ultimately based on value judgements (Reynolds and Stafford Smith 2002; Hobbs 2016) so virtually any change in land cover conditions – regardless of the cause or time period – can be interpreted as land degradation, which has led to grossly inaccurate estimates of the extent of desertification (Herrmann and Hutchinson 2006; Behnke and Mortimore 2016a). Such vagueness lends itself to be misinterpreted and misappropriated to serve any stakeholder interest (e.g., to attract funding, Warren and Olsson 2003; Juntti and Wilson 2005).

Consequences of the prison

In this paper I allege that the concept of desertification is a permanent prisoner of history and is serving a life sentence in a metaphorical UNCCD prison. This has numerous consequences, three of which I describe below.

Consequence #1: The desertification portrayal syndrome

Over 25 years ago, Thornes (1995) lamented that “Discussions of desertification usually start with a long polemic about what desertification actually means....” Today, discussions of desertification usually start with long polemics of what I call the “desertification portrayal syndrome” (DPS), a collection of tautologies, truisms, and stereotypes that consistently occur together in the literature. Components of the DPS include: (1) references to Lavauden (1927) and

Aubréville (1949), who are credited with coining the term ‘desertification’; (2) descriptions of various facets of the history of the UNCCD (i.e., specifically, the three prison-building events described above); (3) acknowledgment of the problems with the definition (including giving the UNCCD definition and mentioning that there are hundreds of others); (4) giving the extent and severity of the problem globally (e.g., the spatial extent of desertification and the billions of people at risk); and (5) a conversation about the general confusion, disagreements, criticisms, malaise, and/or unease surrounding the topic (a survey of DPS usage in 30 reviews from 2010-2021 is given in Table 4).

Why is the DPS so prevalent in the literature? Why are there so many (largely repetitive) review articles on desertification? Why has – over the past 50 years – there been an exponential increase in the number of articles and documents that cite the 1927 Lavauden and 1949 Aubréville papers (Table 5)? Note that since 1970, half of the 1286 total citations have occurred in the past 10 years (see Table 5) (whereas the 30 articles in Table 4 are reviews, the 1286 in Table 5 are overwhelmingly research papers!). I suggest answers to these questions lie in the unique history of desertification.

Unlike biodiversity and climate change, desertification has a “start date” and an “owner”. The start date is 1977 when its owner (the UN Conference on Desertification) selected the Lavauden/Aubréville term, ‘desertification,’ in its moniker. This effectively “extended the natural hazard of the Sahel drought ... into a human hazard by adding a human cause to climatic variation,” thereby launching a highly political process (Grainger 2010) and solidified “the international regime addressing desertification around the UNCCD” (Bauer and Stringer 2009). Also, unlike biodiversity and climate change, desertification carries the stigma of confusion, disagreement and misunderstanding. Issues regarding the term ‘desertification’ and land degradation (described above) and the ineffectiveness of the UNCCD (Bauer and Stringer 2009; Grainger 2009; Conliffe 2011; Juntti 2013; Chasek et al. 2019), are well-documented. Hence, most writers believe it important or necessary to repeat so many of the well-known, established details about desertification (i.e., the DPS)!

Consequence #2: the desertification definition paradox

Desertification has been defined (and applied) in many different ways by the science and policy communities. By 1987 there were already more than one hundred definitions of desertification in the literature, many of which had contradictory meanings (reviewed by Glantz and Orlovsky 1987). More recent reviews (e.g., Thomas 1997; Reynolds and Stafford Smith 2002) suggest little has changed. As Bestelmeyer et al. (2015) acknowledged, “Desertification is a controversial term; even the authors of this paper disagreed about what it should mean.” As shown in Table 2, no single, acceptable definition seems possible nor attainable.

Table 4. Survey of 30 reviews from 2010-2021, illustrating inclusion of the desertification portrayal syndrome (DPS), a collection of tautologies, truisms, and stereotypic descriptors that consistently occur together. No distinction is made between detailed versus cursory treatments of DPS.

Key: •=present; "–"=absent.

Tabla 4. Estudio de 30 revisiones de 2010 a 2021, que ilustra la inclusión del síndrome de representación de la desertificación (DPS), una colección de tautologías, tópicos y descriptores estereotipados que aparecen constantemente juntos. No se distingue entre tratamientos detallados y superficiales del DPS. Clave: •=presente; "–"=ausente.

	Components of the Desertification Portrayal Syndrome						Citation
	Cite/Mention Aubreville and/or Lavauden	Include the Prison-building Narrative	Definition issues / Cite UNCCD definition	Address / Acknowledge confusion / criticisms of issue	Provide Estimates of Global Extent		
					%Land area affected	No. People affected	
% Overall Occurrence=	67%	83%	97%	90%	87%	70%	
Book Title							Citation
<i>Encyclopedia of Geography</i>	• ¹	•	• ²	•	•	•	Moseley and Jermé 2010
<i>Desertification and Its Control in China</i>	–	–	•	–	•	•	Ci et al. 2010
<i>Encyclopedia of Disaster Relief</i>	–	• ^P	•	•	•	•	Snow 2011
<i>Encyclopedia of Global Studies</i>	–	–	•	•	•	•	Reynolds 2012
<i>Encyclopedia of Biodiversity (2nd Ed)</i>	•	•	•	•	•	•	Reynolds 2013
<i>Routledge Handbook of Global Environmental Politics</i>	–	•	•	•	–	–	Juntti 2013
<i>The End of Desertification? Disputing Environmental Change in the Drylands</i>	•	•	•	•	–	–	Behnke and Mortimore 2016b
<i>Biological and Environmental Hazards, Risks, and Disasters</i>	•	•	•	•	•	•	Oswald and Harris 2016
<i>Land Surface Remote Sensing</i>	–	• ^P	•	•	•	–	Escadafal 2016
<i>Environmental Hazards Methodologies for Risk Assessment and Management</i>	•	• ^P	•	•	•	–	Kosmas and Kairis 2017
<i>The Blackwell Encyclopedia of Sociology</i>	•	•	•	•	•	•	Ambalam 2016
<i>Encyclopedia of Soil Science (3rd Ed)</i>	•	•	•	•	•	–	Zdruli et al. 2017
<i>International Encyclopedia of Geography</i>	•	•	•	•	–	–	Davis 2017
<i>Exploring Natural Hazards: A Case Study Approach</i>	•	•	•	•	•	•	Kar 2018
<i>Encyclopedia of Environmental Health</i>	•	• ^P	•	•	•	•	Goudie 2019
<i>Climate Change and Land: an IPCC special report</i>	•	–	•	•	•	•	Mirzabaev et al. 2019
<i>International Encyclopedia of Human Geography (2nd Ed)</i>	•	•	•	•	•	•	Kobayashi 2020
<i>The Palgrave Encyclopedia of Global Security Studies</i>	•	•	•	• ³	•	•	Usha 2020
<i>Terrestrial Ecosystems and Biodiversity</i>	•	•	•	–	•	•	Safriel 2020
<i>Ecology of Desert Systems (2nd Ed.)</i>	–	• ^P	–	–	•	•	Whitford and Duval 2020
<i>Life on Land</i>	•	• ^P	•	•	•	•	Becerril-Piña and Mastachi-Loza 2021
Journal Title							Citation
<i>Land Degradation and Development</i>	•	• ^P	•	•	•	•	Vogt et al. 2011
<i>Land Degradation and Development</i>	–	–	• ⁴	•	•	•	Reynolds et al. 2011
<i>Advances in Water Resources</i>	•	•	•	•	•	•	D'Odorico et al. 2013
<i>Remote Sensing</i>	•	•	•	•	•	–	Higginbottom and Symeonakis 2014
<i>Frontiers in Ecology and the Environment</i>	–	–	• ⁵	•	•	–	Peters et al. 2015
<i>Environmental Earth Sciences</i>	–	• ^P	•	•	•	•	Liu et al. 2015
<i>Frontiers of Agricultural Science and Engineering</i>	•	•	•	•	•	•	Bao et al. 2017
<i>Land Degradation and Development</i>	–	• ^P	•	•	–	–	Prince and Podwojewski 2020
<i>Land</i>	•	•	•	•	•	•	Sterk and Stoorvogel 2020

Footnotes: 1=alludes to Aubreville but do not cite; 2=loosely paraphrased; 3=implied; 4=yes, via citing Vogt et al. (2011); 5=yes, via citing Verstraete et al. (2009); p=describe and/or allude to 1-2 of the 3 events.

Table 5. The number of published articles that cite Aubreville and/or Lavauden over the last five decades. Results obtained from Google Scholar using the search query “(desertification OR “land degradation”) AND (Aubreville OR Lavauden)”, constrained by time period 1970-2020. Search conducted on 16/06/2021.

Tabla 5. Número de artículos publicados que citan a Aubreville y/o Lavauden en las últimas cinco décadas. Resultados obtenidos de Google Scholar utilizando la consulta de búsqueda “(desertificación O “degradación de la tierra”) Y (Aubreville O Lavauden)”, restringidos por el período de tiempo 1970-2020. Búsqueda realizada el 16/06/2021.

Decade	#articles	Percent of total
1970-1979	37	3%
1980-1989	75	6%
1990-1999	161	13%
2000-2009	381	30%
2010-2020	632	49%
TOTAL=	1286	

In spite of the criticisms and shortcomings of the UNCCD definition, a somewhat uneasy **status quo** seems to exist. For example, Verstraete et al. (2009) observed that while “attempts to define desertification have mostly generated confusion,” they opted to use the UNCCD definition because “it is widely accepted.” Similarly, Burrell et al. (2020) acknowledge that “there is no universally agreed upon definition of desertification,” and then base their work on “following the UNCCD definition of land degradation.”

In summary, as evident in Table 2 there has been an **extraordinary consistency over the past 50 years**: what was true in the 1970s is no less true today: there is no acceptable definition. By selecting to use the term ‘desertification,’ the UNCOD effectively politicized the term (Grainger 2010), which led to the adoption of a sufficiently vague definition that lends itself to be both misinterpreted and misappropriated by different stakeholder interests (Juntti and Wilson 2005; Behnke and Mortimore 2016b).

Herein lies the **desertification definition paradox**: While everyone seems to agree that desertification has no acceptable definition – especially the UNCCD definition, which has been heavily critiqued and criticized – most authors simply acknowledge this and then default to using the UNCCD definition!

Table 6. Relative return of searches for scholarly articles on “desertification” and/or “land degradation”, “biodiversity” and “climate change”: (1) Web of Science (Core Collection, July 11, 2021); Searches restricted to the period 1990-2020; and (2) Google Trends (details of searches provided in the caption of Figure 1).

Tabla 6. Tabla 6. Rendimiento relativo de las búsquedas de artículos académicos sobre la desertificación (y/o la degradación de la tierra), la biodiversidad y la (1) Web of Science (Core Collection, 11 de julio de 2021); búsquedas restringidas al período 1990-2020; y (2) Google Trends (los detalles de las búsquedas se indican en el pie de foto de la Figura 1).

Search terms:	“Desertification” or “Land degradation”	“Biodiversity”	“Climate change”
Web of Science			
Total #documents	12 766	158 200	282 360
Relative return	0.05	0.56	1
Google Trends			
10-y average	4.45	26.53	47.07
Relative return	0.09	0.56	1

Consequence #3: The desertification importance paradox

In general, how well-known and understood is the concept of desertification? A survey of high-profile articles and publications suggest it is severely wanting: Reynolds et al. (2007) noted that the UNCCD and related efforts “receive comparatively little exposure in the popular and scientific media”; a UN spokesperson observed, “... most people haven’t heard of it (desertification) or don’t understand it” (Cribb 2017, pg 47); Orlove et al. (2014) argue that the manner in which international organizations seek international aid “(diffuses) the problem of desertification around the world and thus (weakens) it,” and the IPBES (2019) recently observed: “Widespread lack of awareness of land degradation as a problem is a major barrier to action”.

Nevertheless, whenever the topic of desertification is introduced, regardless of the source (research articles, policy documents, web pages, IGO reports, etc.), it is commonplace to find ominous-worded language purporting how it is **one of the major global concerns of the 21st Century**. For example: “Desertification has (long) been a global concern ... (and) it has never been as severe as it is in the present day” (Aliero et al. 2021); “Desertification is currently a major concern, and vast regions have already been devastated in the arid zones of many countries” (Park et al. 2017); “Desertification is a global threat to human beings” (Xu et al. 2019); “Desertification is a phenomenon that ranks among the greatest environmental challenges of our time” (UN 2021); and “Desertification affects as much as one-sixth of the world’s population, seventy percent of all drylands, and one-quarter of the total land area of the world” (Goal 15 of the Sustainable Development Goal; UN 2015).

Is this bombastic language justified? Empirical evidence would suggest otherwise: In terms of the total volume of research produced, the topics desertification and land degradation **pale** in comparison to biodiversity and climate change (see Table 6). This is also true in terms of the general public’s awareness and interest. I used Google Trends (GT) – an online, open-source tracking system that quantifies public interest in any topic (for details and environmental examples, see Proulx et al. 2014; Troumbis 2017; Schaub et al. 2020) – and found that worldwide interest in desertification and land degradation (at least as compared to biodiversity and climate change) is minimal at best (Fig. 1).

Herein lies the **desertification importance paradox**. While everyone seems to agree that desertification “ranks among the greatest environmental challenges of our time”, nobody can agree to exactly what it is and – regardless of the basis of evaluation (research, policy or public interest) – desertification lags far behind biodiversity and climate change.

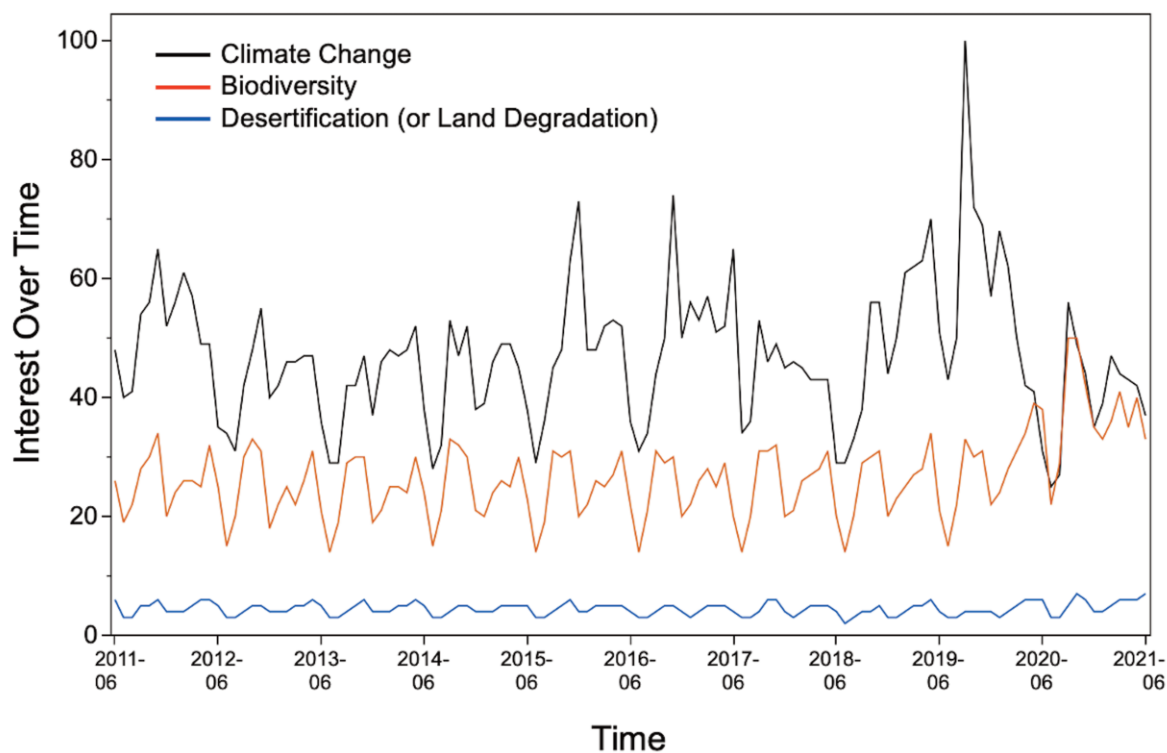


Figure 1. Google Trends for the co-search TOPICS ‘climate change’, ‘biodiversity’ and ‘desertification’ (averaged with ‘land degradation’) from 01/June/2011 to 01/June/2021, worldwide (English language, data retrieved 10/July/2021). Numbers represent search interest relative to the highest point on the chart (a value of 100 is used to relativize the peak popularity for a term; a value of 50 means that the term is half as popular) (see Proulx et al. 2014 for detailed description of GT). Averages over the 10-y period are 48=climate change, 27=biodiversity and 4=desertification and land degradation. Source: Google Trends (trends.google.com).

Figura 1. Google Trends para los TEMAS de búsqueda conjunta “cambio climático”, “biodiversidad” y “desertificación” (promediado con “degradación de la tierra”) del 01/junio/2011 al 01/junio/2021, en todo el mundo (idioma inglés, datos recuperados el 10/julio/2021). Los números representan el interés de las búsquedas en relación con el punto más alto del gráfico (se utiliza un valor de 100 para relativizar el pico de popularidad de un término; un valor de 50 significa que el término es la mitad de popular) (véase Proulx et al. 2014 para una descripción detallada del GT). Los promedios del periodo de 10 años son 48=cambio climático, 27=biodiversidad y 4=desertificación y degradación de la tierra. Fuente: Google Trends (trends.google.com).

Final thoughts and recommendations

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.

Max Planck (Nobel laureate)

As adeptly highlighted by Planck, paradigm shifts in science occur very slowly. Why? In part, because the acceptance (and eventual conversion) to new models of thinking is usually not a matter of proof or argument (Gorham 1991) but, rather, inertia. This is what I experienced at COP9 (see Introduction) and why I think the adage ‘prisoner of history’ is so fitting. The metaphorical prison (UNCCD) and its associated infrastructure and behavior are unlikely to change anytime soon, so what should young scientists entering or working in this field do? To avoid becoming incarcerated in this prison, I offer two broad “avoidance” recommendations.

Avoid the term ‘desertification’

Will Paula’s experience at the Pub be any different in 5-10 years? No! The evidence overwhelmingly suggests that the term ‘desertification’ will continue to be used in an indiscriminate fashion. A close examination of the answers to Paula’s simple question, “So, what exactly is desertification?” (see Introduction) is revealing (note that the pub examples are drawn from the research literature). Similarly, it is commonplace to find the following three terms (in boldface) freely interchanged in research articles: “**desertification** is a form of **land degradation**, which causes **soil degradation**,” and “**soil degradation** is a form of **land degradation**, which causes **desertification**,” etc. Its repeated use has great potential

to reduce, obfuscate, or hide the important complexity of the system being studied (for example, in a recent article in Scientific Reports An et al. 2019, the term ‘desertification’ occurs 110 times, alone constituting 6% of the abstract!). While not technically a “homonym (a word with multiple meanings)”, the word desertification is being used like one to convey numerous, often contradictory, and usually completely different meanings. Young scientists must avoid contributing to this.

Need more proof? The term has now found its way into the literature on **urbanization** (“the desertification of development”; Luke 2020); **marine science** (“the desertification of the sea”; Choi et al. 2020); **infectious diseases** (“a global microbial desertification, particularly from the respiratory mucosa, may have contributed to the severe Streptococcus pneumoniae infection in our patient”; Dubourg et al. 2013); **pharmacology** (“medical desertification” is defined as the increasingly complex access to consultation, which leads to delays in treatment; Mrozovski 2020); and even **medicine**: Ott (2003, who cites Aubréville 1949!) labels desiccation during laparoscopic gas delivery as “peritoneal desertification”!

For almost 50 years there have been many calls for the term to be dropped from the scientific literature (e.g., “Desertification is a popular term that is not useful scientifically”; Paylore 1975). The prison-building events explain how the term ‘desertification’ was intended to invoke political and ideological biases and misconceptions, which has led to the “formation of many of the ideas that buttress the mainstream concept of desertification today” (see Davis 2016 for complete history). As a result, “no discussion (or debate) about desertification starts without bias” (Verstraete 1986). In spite of this, Herrmann and Hutchinson (2005) observe that “the term desertification refuses to fade away be it in scientific or popular circles, despite its obvious imperfection and inadequacies.”

So, when and how should the term 'desertification' be used? Twenty years ago my colleague Mark Stafford Smith and I (Reynolds and Stafford Smith 2002) argued that it is only useful "as a loose term for the broader scale, emergent outcomes of degradation." That is, as Rhodes (1991) had observed 30 years ago: "desertification remains the default accepted term in the vocabulary of those involved in global environmental issues and development policy". Consequently, it is important that young researchers seriously consider if (and when) usage of the term 'desertification' is warranted for any use other than at these broadest scales.

Avoid research on 'ideas of desertification'

After more than 50 years of international attention, the "ideas of desertification" continue unabated, shrouding the nuanced complexities of land degradation, and thus misleading and distracting from relevant or important questions. As Sharp (1977) described it 45 years ago: "it is a bit like chasing a mirage." Toward this end, Davis (2017) notes, "(It) is the idea of desertification, rather than the processes of land degradation ... that has been more influential over the last two centuries."

In this paper I have described some of the major "ideas of desertification," which continue to dominate the field. Therefore, my second recommendation is that young researchers avoid research on these "ideas of desertification"! While there is a plethora of "desertification ideas" (some are historically notable and provide context for current events), these are likely to play **little or no role** in advancing fundamental, scholarly scientific understanding of land degradation.

Undoubtedly, in the next 5-10 years, new articles on desertification will appear. Many of these will bemoan the lack of an acceptable definition (and thus can be added to Table 1), but to what end? Many of these will repeat (yet again) the components of the desertification portrayal syndrome, but to what end? Many of these will claim that desertification is one the greatest environmental challenges of our time, but to what end? Focusing on "ideas of desertification" will lead young scientists into the trap of contributing to the "seemingly endless semantics and diagrams published on desertification (that) have ... little demonstrable, practical, influence on research, prevention or remediation" (Prince 2016).

Final thoughts

It is important to separate the global importance of land degradation from the issues described here: they are not the same. My goal in this essay is to convey to young scientists that conducting research on land degradation is hard and that it's important to be as careful (rigorous, scholarly) as possible. As is normal for all disciplines, there is a need for new ideas, new approaches, and new leaders. Obviously, as Planck noted, it won't be easy. It can take many people and many years to overcome obstacles to achieve real change: something the field of land degradation desperately needs.

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