

# BIOCULTURAL DIVERSITY: TOWARDS RESILIENCE IN SOCIAL-ECOLOGICAL SYSTEMS

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## ABSTRACT

*Biocultural diversity has been defined as the diversity of life in all its manifestations – biological, cultural and linguistic – which are interrelated in a complex of socio-ecological adaptive systems. As such, biocultural diversity is a key factor in resilience, which depends upon diversity as a source of adaptation and innovation. Recent work to produce global indicators of biocultural diversity has highlighted three key geographic areas in which high biological and cultural diversity co-exist at high levels.*

*This paper introduces the concept of biocultural diversity, focusing on the crucial importance of linguistic diversity, which is highly threatened at the global level. Some recommendations for further steps are offered, based on the Index of Biocultural Diversity, in hopes that finer-resolution work will highlight more about correlations, threats and the local dynamics through which biocultural diversity is preserved, utilized or lost. The paper also suggests the need for a governance framework in analyzing biocultural diversity.*

## 1. DIVERSITY, ADAPTATION AND RESILIENCE

Diversity is the key to resilience within complex adaptive systems, such as the social-ecological systems through which natural resources are managed. Higher levels of diversity mean that there are more options that can be drawn upon when shocks require that a system reorganizes itself (Norberg and Cumming, 2008). The 1980s saw a profound increase in understanding and awareness of the value of the world's biological diversity, not only for maintaining the integrity of ecosystems, but for the provision of goods and services that sustain society as well. Concern for the resilience of ecosystems has led to global- and regional-level efforts to devise indicators to use in the monitoring of ecological change as driven by the fast-paced economic development of this phase of globalization.

## 2. LANGUAGE DIVERSITY: THE OTHER EXTINCTION CRISIS

Cultural diversity is threatened by the same forces of economic development that exert pressure on the world's biodiversity. Linguistic diversity is a commonly used proxy for cultural diversity, but nevertheless is not well understood by society in general, nor has it received a high level of attention with the policy community.

### 2.1 Endangerment and extinction

Global linguistic diversity faces higher rates of extinction than biological resources (Harrison, 2007). Conservative estimates of the threat to the world's languages suggest that within the coming 100 years as many as half may and possibly 80 percent disappear (Krauss, 1992). Of the approximately 6,800 languages spoken today, only 600 can be considered to be "safe".

The main threat to languages is from replacement by another language that is, for social, political or economic reasons, stronger. Language death can come about as a choice by speakers to use a different language, or by the imposition of a different language through government policies such as education and national language development. Even in the case where a ‘choice’ has been made by speakers to abandon a language, various social pressures make the freedom of this choice suspect.

### 2.3 Erosion of knowledge: What is lost when a language dies?

Language’s prime function may be considered to be communication. However, when a language disappears, the loss is an “erosion of knowledge” (Harrison, 2007) and is thus more profound than the simply disappearance of a tool of communication between individuals. Languages represent the shared knowledge and experience of their speakers, including belief and value systems, ecological knowledge, history and the foundations for cultural identity. It has been argued that “any reduction of language diversity diminishes the adaptational strength of our species because it lowers the pool of knowledge from which we can draw” (Mühlhäusler, 1995:160). Indeed, language is a key element of the human diversity that also includes other social institutions, norms and knowledge that form the foundation for adaptation in times of upheaval in social-ecological systems (Norberg and Cumming, 2009).

## 3. DISTRIBUTION OF LINGUISTIC DIVERSITY

Languages are distributed unevenly across the regions of the world. Ninety-six percent of the world’s languages are spoken by a mere four percent of the world’s population. This means that the fate of the world’s linguistic diversity is in the hands of a very small number of people.

**Table 1. Linguistic diversity by region (Nettle, 1999)**

Area	Languages	Language density*	Stocks	Phylogenetic density*	Languages per stock
Africa	2,614	88.8	20	4.4	130.7
N Eurasia	732	21.5	18	3.3	40.7
S & SE Asia	1,998	110.4	10	3.8	199.8
Oceania	309	322.1	4	-	76.5
New Guinea	1,109	1,196.7	27	227.3	41.1
Australia	234	30.41	15	13	15.6
N America	243	12.3	50	16.9	4.9
Mesoamerica	381	144.2	14	71.7	27.2
S America	595	33.3	93	34.8	6.4

(\*Density is calculated as units per million km<sup>2</sup>.)

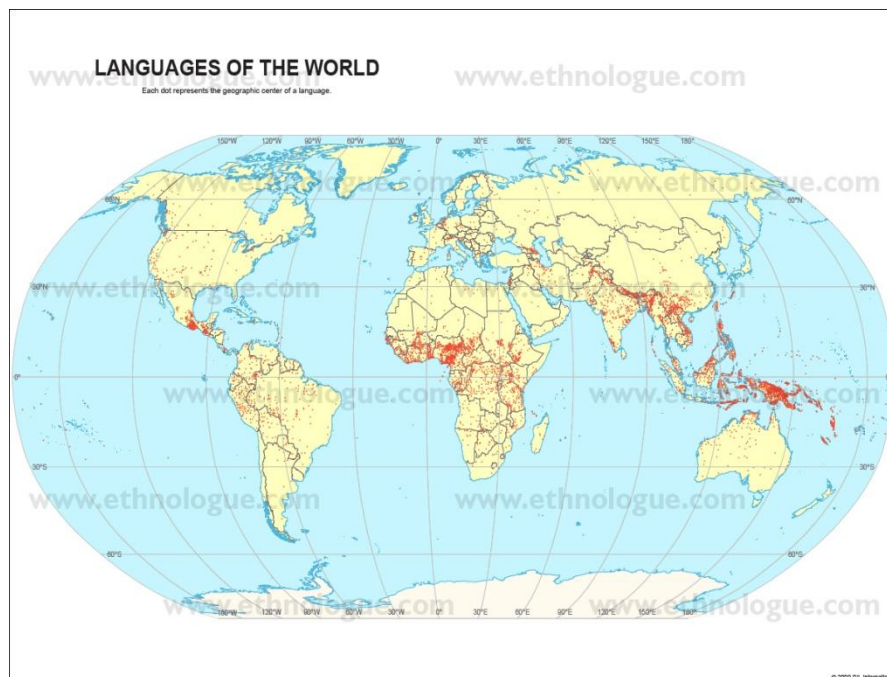
### 3.1 Three types of diversity

It is useful to consider three types of diversity (Nettle, 1999). First, language diversity is simply the number of languages that are spoken in a given area. Second, phylogenetic diversity refers to the number of languages in a given area that have shared features resulting from common descent. The deepest node of phylogenetic relation is known as a stock, and represents a group of related languages. Finally, structural diversity is the many variables that may be shared by the grammars languages, regardless of genetic relationship. Table 1 shows linguistic diversity – language and phylogenetic – across major regions of the world.

In terms of language diversity, Africa, New Guinea and Asia are clearly the highest. However, looking at phylogenetic diversity, New Guinea is far and away the richest area. Mesoamerica is a distant second, but still quite higher than other regions. Higher phylogenetic diversity indicates a higher degree of difference among languages.

### 3.2 Spatial distribution

The spatial distribution of languages is shown in Figure 1.



**Figure 1. Languages of the World (Lewis, 2009)**

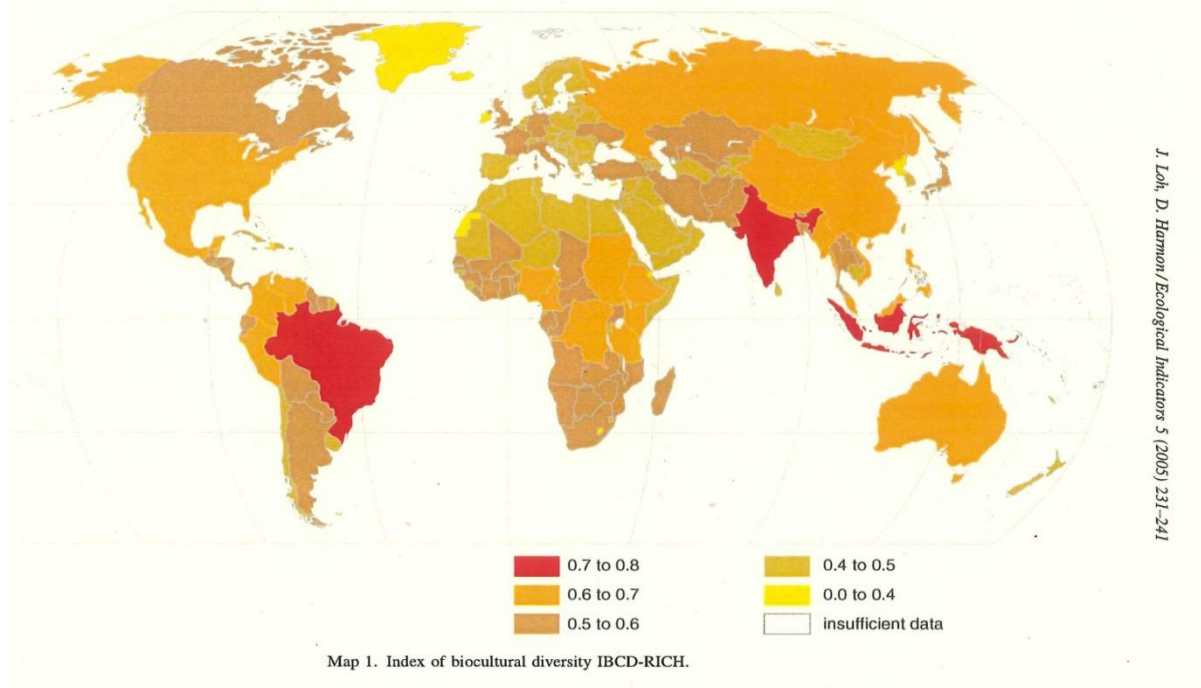
There is a general trend towards concentration of languages in the tropical zones, across Asia, Africa and the Americas.

## 4. INDEX OF BIOCULTURAL DIVERSITY (IBCD)

In the 1990s, there was a growing recognition that the areas of high biological diversity and cultural diversity showed a significant level of spatial correspondence and both are threatened by similar forces (Maffi, 2001). A collaborative effort bringing together biologists,

linguists and anthropologists led to the formation of an area of research known as biocultural studies, which is defined as the diversity of life in all its manifestations – biological, cultural and linguistic – which are interrelated in a complex of socio-ecological adaptive systems (Maffi, 2005).

An Index of Biocultural Diversity (IBCD) was presented in 2005 (Loh and Harmon, 2005). The index, which drew together data from a number of published databases, integrated 2 biological (bird/mammal and plant species) and 3 cultural (language, religion and ethnic groups) indicators for national-level data.



**Figure 2. Index Biocultural Diversity Spatial Distribution (Loh and Harmon, 2005)**

The IBCD consists of three components: 1) biocultural richness (**RICH**), 2) an areal component adjusted for land area (**AREA**), and 3) a population component adjusted for human population (**POP**). Figure 2 shows areas of high biocultural diversity according to the richness component, where the Amazon, South Asia and the Indo-Malaysian archipelago have the highest biocultural diversity values, in absolute terms of richness.

Analysis of all three components yields somewhat different results. Aggregated across components, the areas of highest biocultural diversity are the Amazon Basin, Central Africa and Indomalaysia/Melanesia. Table 2 shows the top ten countries for the three components. When adjusted for area and population, Central Africa scores higher than South Asia.

While the IBCD provides a useful picture of the correlation between biological and cultural diversity, the framework of biocultural diversity also posits causal relationships between the two. This raises the historical question of how diversity in natural and human systems is created. It also requires analysis of the empirical relationships between loss of habitat or species and the loss of languages. There are compelling arguments that loss of biological diversity has resulted in a decrease in the number of languages spoken in areas of South America (Lizarralde, 2001). Less evidence has been provided on the effects of language shift on habitats or species.

**Table 2. Index of Biocultural Diversity Top Ten**

<b>RICH</b>		<b>AREA</b>		<b>POP</b>	
Indonesia	0.760	Indonesia	0.762	PNG	0.868
PNG	0.728	PNG	0.755	French Guiana	0.754
Brazil	0.710	Colombia	0.688	Suriname	0.738
India	0.709	Cameroon	0.685	Cameroon	0.727
China	0.689	Malaysia	0.676	Indonesia	0.723
Nigeria	0.688	Brunei	0.669	Brunei	0.719
US	0.678	India	0.663	Colombia	0.719
Cameroon	0.671	Nigeria	0.658	Gabon	0.712
DRC	0.669	Nepal	0.657	Guyana	0.710
Colombia	0.664	Brazil	0.650	Solomons	0.709

From a policy perspective, this direction of causality may be important in mobilizing the political will and economic resources to address the issue.

## 5. DISCUSSION: INDICATORS AND BEYOND

The IBCD provides a valuable view on the correlation of cultural and biological diversity at the global level. This resource should be valuable for decision-makers within national governments and regional agencies, especially in the allocation of resources for priority areas of conservation work. However, global level indicators based on national-level data hide many sub-regional dynamics that may be critical for understanding what can be done at the policy level.

### 5.1 Refining analytical value of diversity indicators

Global indicators are generally limited by data aggregated at the national level. Although this may be convenient for delivering messages to the policy community, regional and local-level analysis should be conducted to uncover a finer resolution set of interactions and dynamics. It has already been pointed out that sub-regional examination of the global correlations between biological and linguistic diversity may not hold more locally (Maffi, 2005). Furthermore, use of IBCD in conjunction with other indicators of socio-economic development and development, such as the Human Development Index, Transparency Index, Press Freedom Index and other indicators of governance, could produce valuable insights. There have been calls for increased attention to language rights (Skutnabb-Kangas, 2001), which suggest a focus on how governance at global, regional, national and local levels affects linguistic diversity.

### 5.2 Understanding multilingualism

It is widely believed that multilingualism is a key to preserving linguistic diversity. By the same token, multilingualism is also a way for society to draw on the diversity of cognitive capacity encoded in different languages. Indicators of the status and function of

multilingualism in society would be a valuable complement to indicators of threat. Consideration of an indicator should be preceded by research on dynamic multilingual situations, focusing on areas of high biocultural diversity, under high/low threat conditions.

### 5.3 Spatially explicit indicators of threat

The IBCD shows the correlation and distribution of biological and cultural diversity. In an applied policy context, an indicator of global, regional and local threats to biocultural diversity would be a valuable addition. Typologies of language endangerment have been produced, and could inform the development of spatially explicit indicators of threat. Socio-linguistics has established that languages should be studied in their social contexts. Linguistic diversity should be studied within a governance framework, that is socio-economic and political decision making context in which it is situated.

## 6. CONCLUSION

Indicators of biocultural diversity are critical for monitoring the current trends and future directions human society is taking. The study of complexity and resilience, with its special emphasis on the importance of diversity as a source of adaptive capacity, benefits from efforts to draw out the relationships between natural and human systems. General indicators, as a tool for monitoring, should be supplemented with meso- and micro-level analysis drawn from the real-world interactions between biological and cultural resources. There is a need to focus on linking indicators of biocultural diversity to the institutions and process of governance at global, regional and national levels.

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