

Ecological Perception: Seeing Systems

Abstract

Graphic designers have the unique ability to make hidden ecological processes visible by revealing relationships, patterns and dynamics in complex socio-ecological systems. This paper describes how communication design can support relational perceptual practices and even nurture ecological perception. It presents specific methods to harness the latent potential of graphic design to communicate the context, comparisons, connections and causality. It proposes that aesthetics experiences can provoke deep perceptual insights supporting new ways of perceiving our relationship with the environment, our ecological context. In ways described in this paper, graphic design has the potential to nurture the ability to 'see systems' – supporting both ecological perception and ecological literacy.

Keywords

Visual intelligence; perception; environmental communication; ecological literacy; graphic design

Graphic design has an important role to play addressing the environmental crisis. Image-makers can reveal relationships and causality in complex systems making environmental information accessible. Images can be used to either conceal or reveal the ecological basis of humankind's existence, including the environmental impacts of current ways of living. This paper will focus on how communication designers can reveal ecological context and aid the development of new perceptual capabilities in response to environmental problems. Environmental communication scholar Julie Doyle argues that photography records circumstances of the past, so its usefulness in communicating ecological messages is limited to displaying damages already done (2009). This paper suggests that graphic design has greater potential to respond to environmental communication challenges due to its ability to visualize future scenarios, abstract concepts and complex systems. Designers use diagrams, maps, charts, graphs, illustrations, network visualizations, data visualization and information graphics to visualize complex information. These visual devices display patterns and dynamics within both ecological systems and human-made systems. In these ways, images can make visible currently invisible ecological processes, consequences and interconnections.

This paper will describe why and how visual communication has exceptional potential to communicate environmental information and even support new ways of seeing, referred to here as relational or ecological perception. To develop this concept, the paper will review the ways in which perceptual practices have evolved over time, starting with a brief history of communication theory, the emergence of visual intelligence and the use of metaphors to challenge and potentially disrupt preconceived assumptions. Specific strategies to harness the latent potential of graphic design to communicate context, comparisons, connections and causality will be introduced. The paper draws on a wide range literature synthesizing ideas from communication theory with ecological theory to inform new strategies for designers to address complex environmental problems. The study of perception has traditionally been a philosophical inquiry and while the cognitive sciences now have empirical work on perception, the focus of this paper is the intersection of communication and ecological theory.

The Emergence of Visual Intelligence

Social theorists and historians describe changing modes of communication and media as having profound social consequences. Famously, Marshall McLuhan explained, “the effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance” (2001 [1967], p.290). The historical shift from oral to written cultures in the West (starting in Greece around the 5th century BC) shaped new ways of perceiving and thinking that emerged in this time period. Historian Walter Ong describes oral cultures as having very different perceptual practices than those that characterize written cultures. In oral culture knowledge is fixed, formulaic and mnemonic (1982, p.24). Reading and writing, on the other hand, are dissecting processes that organize information in a linear sequence and establish a context free mode of communication, conditioning consciousness towards individualism, reductionism and lack of context or place (1982). Ong’s analysis of the seismic shifts that occurred during the historical oral-written communication revolution informs an understanding of an equally dramatic contemporary communications revolution from the written to the pictorial and iconic (digital could be added to this list, although it is outside the scope of this paper). The theory that human perception changes due to changes in modes of communication has significant implications for environmental learning in an increasingly visual contemporary culture.

The acute visuality of contemporary culture has led many visual theorists to support the concept of a contemporary pictorial turn (Donis, 1973; Mitchell, 1994; Barry, 1997). Others extend this idea and propose that visual culture is contributing to the emergence of new cognitive capacities (Barry, 1997; Horn, 1998; Chabris & Kosslyn, 2005). Some see dangers in a pictorial turn. Chris Hedges describes an image-based culture as no longer having “the linguistic and intellectual tools to cope with complexity, to separate illusion from reality” (2009, p.44). Visual scholar Ann Marie Barry notes the danger of visual culture if approached uncritically,

Today advances in technology have given commercial and political interests the ability to manipulate the way we see and comprehend our world before our understanding of visual images has fully matured. Few of us today understand how perception works, how cognition and emotions function, and how manipulations of attitudes, ideas and values can be accomplished. Fewer still, it seems, appreciate the implications of this (1997, p.333).

Visual literacy has been a priority for critical educators ever since Donis Dondis first articulated the need for a critical reading of images in *A Primer of Visual Literacy* (1973). Visual literacy is essential for both image-makers and the wider public who are bombarded with visual messages on television, on-line, out-door advertising and in print. Once approached critically, the positive potentials of visual communication are the opposite of its dangers. Images are effective tools to convey meaningful messages and facilitate learning.

The concept of visual intelligence was developed by Ann Marie Barry in the seminal book *Visual Intelligence: Perception, Image and the Manipulation of the Visual in Communications* (1997). Barry describes visual intelligence as necessary not only to resist the influence of messages absorbed uncritically, but also to develop the capacity to think in abstract and perceptually oriented ways (1997, p.7). An awareness of the logic of visual messages is fundamental because visuals are a powerful force of socialization. Barry’s concept of visual intelligence suggests new perceptual capacities will extend the range of human communication and ways of knowing. She explains that perception is the basis of knowing and understanding but our relationship to perception is naïve. Too often, she says, “to see is to believe” (p.1). Visual intelligence involves a perpetual awareness that the visual world is an interpretation of reality, following Alfred Korzybski’s first principle of general semantics; “the

map is not the territory” (1933, p.750). Barry identifies the need for a critical function to interrupt and critically assess the perceptual process since perception “is not a direct recording of what is out there, but a mental configuration that we interpret as an image – the end result of a highly exploratory and complex information-seeking system” (p.37). It is because visual representations are understood as an interpretation of reality, and not reality itself, that images can also be used to challenge and re-interpret dysfunctional ways of knowing – such as those ecologically illiterate perspectives which perpetuate environmental problems.

Herein lies an opportunity for intervention with visual communication. When the conceptual maps we use to understand reality are acknowledged merely as a representation of reality, “re-visioning” to create more effective representations becomes possible. Since visuals are capable of displaying non-linear, dynamical systems and revealing pattern (Barry, 1997, p.9), they are useful at displaying relationships in complex ecological systems. This links visual intelligence to the capacity to distinguish errors in current ways of knowing, epistemologies or paradigms. Visual intelligence lends itself to the types of competencies that support ecological literacy and ultimately ecological perception. Communication theorists Gregory Bateson (1972), Ann Marie Barry (1997) and others claim that perception is a learnt skill, which is “fixed into patterns” (Barry, 1997, p.50). If this is true, graphic designers can strategically design images to support the development of new perceptual capacities.

Visual intelligence as described by Barry is considered to be inherently relational and contextual. It is similar in many ways to the concept of design as a form of intelligence as first described by Nigel Cross (1990). Both Barry’s and Cross’ work draw on Howard Gardner’s (1983) ideas on multiple intelligences (Cross, 2010; Barry, 1997). According to Gardner, visuals are linked to “spatial intelligence” (skilled at mental imaging) and patterning intelligence (the ability to see patterns) (Barry, 1997, p.8). Barry describes visual intelligence as enabling greater understanding of patterns and dynamical systems. She distinguishes between the logical and linear structure of verbal language and the non-linear, dynamic and open structure of visual language and suggests that visual intelligence is a means of integrating these modes.

The concept of design intelligence is complementary to Barry’s notion of visual intelligence. Nigel Cross describes designerly ways of knowing as “sensitive to nuances” (2010, p.2), skilled at recognizing pattern, and offering “a way of thinking that involves operating seamlessly across different levels of detail, from high level systemic goals to low level physical principles” (*Ibid.*, p.3). Design intelligence is an “ability to shift easily and rapidly between concrete representations and abstract thought, between doing and thinking” (Cross, 2010, p.3). Like visual intelligence, design intelligence can be trained and developed (*Ibid.*, p.5). Both visual intelligence and design intelligence describe expanded, multi-dimensional perceptual capacities.

The current popularity of data visualization, network visualization and other new visual tools suggests that visual culture is already supporting new perceptual practices and tendencies. In *Visual Language* (1998) Robert Horn claims that the proliferation of visual communication indicates that we are witnessing the emergence of a new visual language that integrates words, shapes and images. This visual language is capable of expressing complex ideas more efficiently than anything we have yet known. He describes visual language as an antidote to the fragmentation and reductionism of current ways of communicating, and a means to deal with increasing complexity:

Visual language has the potential for increasing human “bandwidth”, the capacity to take in, comprehend, and more efficiently synthesize large amounts of new information. It has this capacity on the individual, group, and organizational levels (2001, p.1).

According to Horn, human cognitive effectiveness is constrained by the “limitations of working memory that George Miller identified in 1957” (1998, p.4) but the integration of words, images and shapes within visual language create tools to deal with increasing complexity, directly addressing limitations of human cognitive abilities. Horn explains: “without aids our minds are quite unable to cope with the sheer size, interrelatedness and complexity of projects” (1998, p.45). Visual language expands human capacities to deal with multifaceted information, enabling synthesis of disparate information and facilitating the emergence of new cognitive capacities in the face of increasing complexity (Chabris & Kosslyn, 2005, p.36). Empirical studies indicate that the more visual communication becomes, the more likely it is to be recalled. This is known as “the pictorial superiority effect” (Medina, 2008, p.233).

Metaphor

Society’s ongoing development of visual metaphors expands our capacities to communicate visually. Human ability to understand new information is enhanced as new visual metaphors are developed since “cognitive abilities are thoroughly enmeshed with metaphors” (Horn, 1998, p.113). Visual metaphors are considered to have more emotional impact than linguistic metaphors (Ortony, 1979, p.11) while multimodal metaphor allow for even subtler ways of communicating, “hence achieving rhetorical effects more unobtrusively” (Forceville, 2008, p.477). Metaphors are used to communicate ideas, construct meaning and establish cultural legitimacy by harnessing preconceived ideas to help create new understanding. One of the ways that visual communication builds meaning is through visual metaphors that are emotionally charged. Metaphors are cognitive tools the minds uses to learn new concepts, and this is especially powerful when new ideas are emotionally meaningful to audiences.

Decoding visual communication is a learning process. This learning involves deciphering the meaning of visual metaphors and their cultural connotations. We must all learn to decipher visual communication, as demonstrated by psychologist and visual theorist Jan B. Deregowski’s research with tribal communities. On first contact, members of the Me’en tribe in Ethiopia could not interpret a colouring book illustration of an antelope (1980, p.113). Deregowski theorizes that the Me’en were not familiar with foreign visual codes used to represent the animal that was a regular feature of their lives. Each culture has unique conventions for representing the outside world and the ability to interpret visual communication is a learning process. Visual communication shapes experiences and makes meaning as a result of connections between metaphor and content. Graphic designers organize analysis through visual metaphors in order to convey information and also create emotional impact. Metaphors are understood through cognitive frames that are the result of our experiences, beliefs and assumptions.

Using metaphors in new contexts allows communication designers to challenge preconceived ideas and established meaning. Metaphors have the potential to reframe our understanding of an issue and have been used in the past to dramatically shift humankind’s understanding of our relationship to the natural world. For example, the scientific revolution saw a complete change in ontology and epistemology from earlier periods replacing the geocentric view of the Bible with Copernicus’ heliocentric theory of the movement of planets, Galileo’s theory of gravitational bodies, Frances Bacon’s empiricism, Rene Descartes’ rationalism and Isaac Newton’s mechanism (Sousa Santo, 2007, p.17). Ecofeminist historian Carolyn Merchant describes how the metaphors used by the fathers of the scientific revolution Francis Bacon and Rene Descartes served to “reconstruct human consciousness” (2001, p.281) in the 16th-17th century by framing nature as a resource for exploitation. Francis Bacon described nature as a woman who was to be put into constraints to “conquer and subdue her, to shake her to her foundation” (Bacon quoted in Merchant, 2001, p.277). The dramatic change in human-

nature relations that occurred in this time period constituted, for Merchant, “the death of nature – the most far reaching effect of the Scientific Revolution” (2001, p.281). Ecological theorists (Bateson, 1972; Capra, 1997; Sterling, 2001) and ecofeminists (Merchant, 2007; Shiva, 1988) describe the root metaphors on which the Western scientific establishment has been built as based on epistemological error and violence towards nature. Today, communicators can use metaphors to generate new frames of reference reflecting ecological literacy and mutualistic relations with the natural world.

Ecological Perception

The fact that perception is influenced by communication practices and that perceptual practices can even be intentionally developed, is good news for sustainability communication and education. Environmental learning is not simply a matter of learning a few facts, but is a challenge to worldviews and ways of knowing that deny ecological relations. Ecological perception offers the potential for “re-visioning” human-nature relations. In visualizing ecological processes and relationships graphic designers and other visual communicators can directly address perceptual practices that perpetuate the denial of ecological context. Visual communication can be created with the explicit intention of nurturing new perceptual practices to engage ecological perception. Laura Sewall explains that it is the focus of attention that “often means the difference between seeing and not seeing” (1995, p.204). Through repetition we develop “visual systems structures, or neural networks, [which] determine our perceptual tendencies” (Sewall, 1995, p.207). Since perceptual attention and perceptual habits are a basis for our way of seeing and knowing, designers have the potential to nurture changes in ways of seeing and knowing through directed selective attention.

Ecological theorists describe the current way of perceiving and knowing human-nature relations as characterized by “epistemological error” (Bateson, 1972). Epistemological error is the illusion of independence from ecological context. Epistemological error is reinforced through perceptual habits of mind, which are in turn embedded within and further reinforced by social practices, media and communication. This paper suggests that visual communication can be strategically constructed to encourage perceptual habits that challenge and ultimately transform the perceptual practices currently reinforcing epistemological error. Ecological perception can replace erroneous perception of ontological atomization and radical independence from the natural world through a process of establishing new perceptual habits. These processes can be facilitated by design. Ecological perception is developed through a process of learning to notice relationships with the environment and our own embeddedness and interdependence with our ecological context.

Ecological theorists Laura Sewall and David Abrams see perception as holding unique potential to address the denial of ecological relations. Sewall and Abrams characterize the environmental crisis as arising from a collective perceptual disorder (a kind of myopia) disabling the recognition of both ecological context and interconnectedness. Sewall’s work on perceptual psychology and Abrams work on cognition and perception explores how the manner in which reality is “seen” or “perceived” affects understanding. Both theorists claim that perceiving our own embeddedness within wider ecological systems is key to ecological learning. The goal sounds simple enough: encourage the perception that “we are within the biosphere as opposed to on the planet” (Sewall, 1995, p.212). In practice, developing this awareness is easier said than done. Sewall and Abrams both use the depth metaphor as a means of describing a shift to a biocentric perspective. The notion of depth in the context of perception is important because the deeper the perceptual experience, “the greater the potential for transcending perceptual habit” (Sewall, 1995, p.213). Depth here refers to the

perception of ecological embeddedness rather than a mere intellectual recognition of this idea as a theoretical construct.

Ecological thought emphasizes relationships and context. Sewall explains that current perceptual practices focus on objects as atomized, isolated elements; “we readily perceive things but are relatively insensitive to the relationships between them” (1995, p.207). Perceptual practices supporting ecological learning require a shift from *seeing objects* to perceiving *interfaces between* objects. Sewall describes specific strategies that support ecological perception: 1) learning to attend within the visual domain; 2) learning to perceive relationships; 3) developing perceptual flexibility; 4) learning to re-perceive depth; and 5) the intentional use of imagination (*Ibid.*, p.204). These perceptual practices can broaden and deepen the scope of our understanding of ecological relations by supporting a shift in our focus of attention and thus a shift in “subjective reality by facilitating the perception of some objects, relations and events to the exclusion of others” (*Ibid.*, p.207). New understanding is developed as new perceptual practices “extend our narrow experience of self...[and support an] identification with the external world” (*Ibid.*, p.204). In these ways, images can work to help audiences notice ecological relations and nurture new perceptual habits. Learning to perceive connections, interactions, influences and dynamics supports ecological perception.

Ecological thought is theorized as inherently is qualitative, rich in complexity and mindful of pattern. Ecological theorists Fritjof Capra and Hazel Henderson (2009), Boaventura de Sousa Santos (2007) and others have emphasized the need to focus on qualitative reasoning. Whereas quantitative analysis often results in a reduction of the complexity of ecological processes, qualitative thought provides a complementary mode for developing appreciation for the [our] environment. One of the ways in which qualitative approaches differ from quantitative analysis is in the appreciation of pattern. In ecology causal links often cannot be established with definitive proof, so scanning for pattern can lead to noticing anecdotal incidents as weak signals of emergent phenomenon. Graphic designers can nurture ecological perception by strategically creating images that encourage qualitative imagery that captures the patterns and dynamics of complex ecological processes and support relational ways of knowing.

Visualizing Ecological Relations

Graphic designers make complex information accessible through the selective framing and structuring of information to highlight relevant details. These skills can be applied to reveal environmental context and to nurture relational ways of perceiving and knowing. Designers can work strategically to encourage ecological perception through constructing displays of context, comparisons, connections and causality in complex socio-ecological systems.

Context

Visuals emphasizing contextual knowledge create meaning through the display of relationships, often referring to specific physical space, such as geographic maps – although maps can also be about ideas. The tradition of geographic map-making is engaged with the visual representation of context, relationships and hierarchy. Maps support the development of situated knowledge by visualizing “place” and create meaning through displays of relationships between elements. With maps the fine texture leads to “micro/macro reading of detail and panorama” thereby potentially realizing both local and global comparisons (Tufte, 1990, p.33). Maps situate information in a particular location helping audiences to understand specific details as well as wider context. Geographic maps use devices such as the use of colour, shade and icons as indication of depth, outlines of boundaries and types of geological

or human-made features. Figure 1 is a visualization of biodiversity loss over time, illustrating species extinction due to human impacts over several centuries.

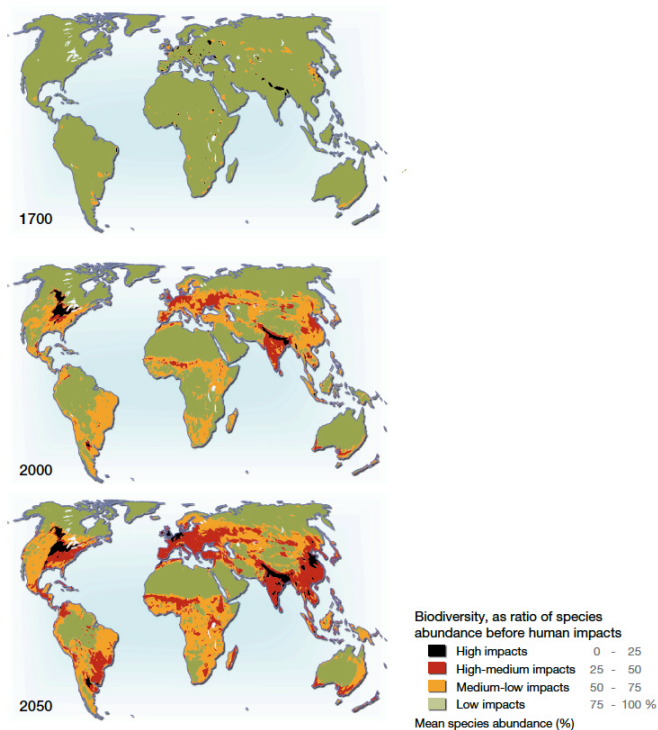


Figure 1. Biodiversity, as a ratio of species abundance before human impacts. Nellemann, C. and Corcoran, E. *Dead Planet, Living Planet*. UNEP, 2010.

Images can also be used to visualize context in realm of ideas. Knowledge maps or visual cognitive maps communicate multi-dimensional information and mental models that are useful for sustainability communication on complex multidisciplinary issues. Robert Horn lists a wide variety of uses for knowledge maps: strategy maps, options maps, scenario maps, argumentation maps, cross-boundary causality and dynamics maps, unknown territory maps, public rhetoric maps, worldview influences maps, dilemmas map, paradoxes maps and more (2001, p.4-5). These maps illustrate the “logical structure and visual structure of the emerging arguments, empirical data, scenarios, trends and policy options... and help keep the big picture from being obscured by the details” (*Ibid.*, p.5). While geographic maps illustrate complex interrelationships in geophysical space, knowledge maps illustrate the structure of complex issues and arguments.

Comparisons

Images are useful tools to facilitate comparing quantitative information. Typically charts and graphs are used to comparing quantities and datasets. Designers have a wide range of options including the histogram, bar chart, pie chart, line chart, area chart, bubble cart, radar chart, waterfall chart, tree map, scatter plot and box plot. The images below display the ecological footprint of nations (Figure 2) and global carbon dioxide emissions (Figure 3). Figure 2 illustrates the ecological footprint per capita by country with each line on the graph also divided into the ratio of different types of natural resources depletion. This bar graph effectively displays vast amounts of data, facilitating comparisons between nations. Figure 3 illustrates national levels of carbon emissions, facilitating quantitative comparison of carbon emissions per nation. The graphic also includes temporal comparisons, in terms of change

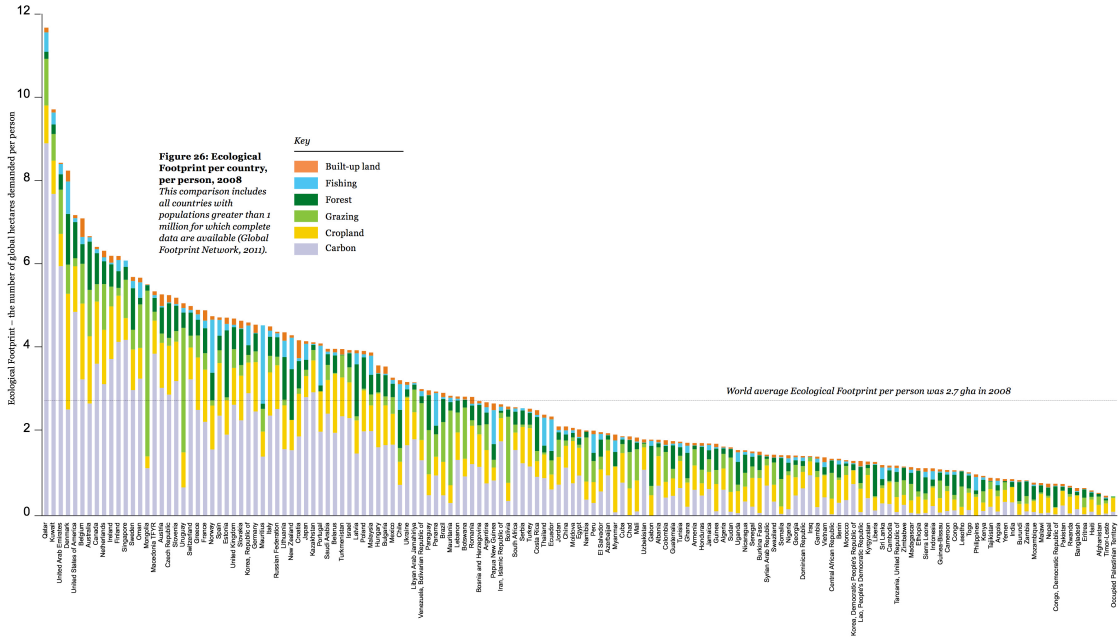


Figure 2. Ecological footprint per country, per person, 2008. WWF. 2012. *Living Planet Report 2012*. WWF International, Gland, Switzerland.

from previous years. This bubble chart brings together complex data sets to clarify where carbon emissions are produced effectively displaying critically important information. Unfortunately, the map does not take into account the embedded emissions in products that are consumed by wealthy nations but produced elsewhere. Thus the image is also an example of how political loaded perspectives and assumptions can be embedded into environmental communication.

An atlas of pollution: the world in carbon dioxide emissions

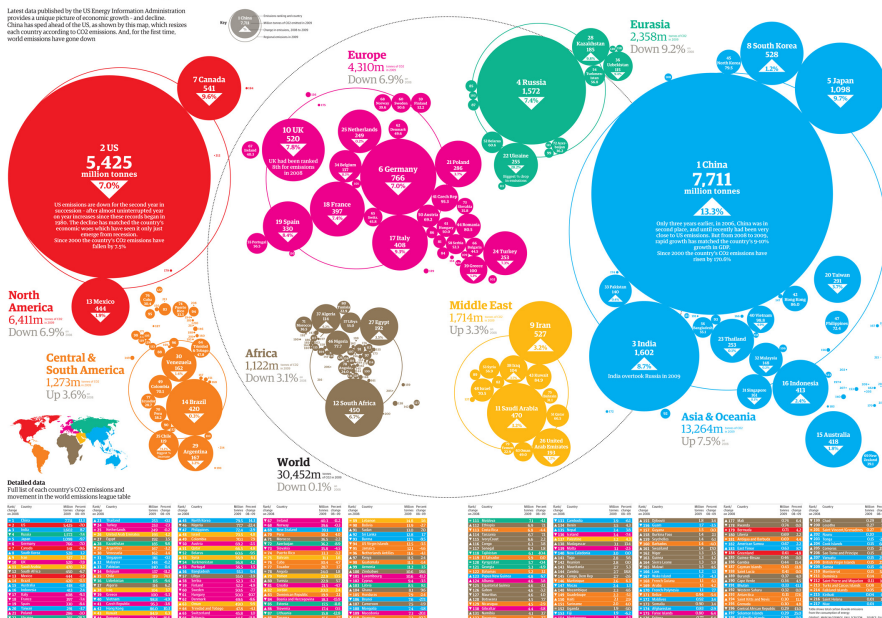


Figure 3. An atlas of pollution: the world in carbon dioxide emissions. *The Guardian*, 2011.

Connections

Images are well suited to map connections and interactions of social, economic and ecological actors in complex systems. New forms of visual representations such as network visualization display webs of relationships. Unlike text and speech, network visualization encourages undirected, interactive reading by illustrating patterns and causal relationships. Herein lies a major advantage of visuals in its ability to help audiences move away from linearity towards more relational ways of knowing. Network theorist Albert-Laszlo Barabasi explains that the attention “must move beyond structure and topology and start to focus on the dynamics that take place along the links” (2003, p.225). Network visualizations can display the nature of relationships between nodes (representing actors) and the connecting arches (representing interactions) thereby revealing information that might be unavailable in any other manner. Manuel Lima has collected network visualizations in his extensive website repository and book *Visual Complexity: Mapping Patterns of Information*. Figure 4 displays Lima’s typology of network visualizations, illustrating how images of networks are helping communicate network science and illustrate the ways that complex systems are organized.

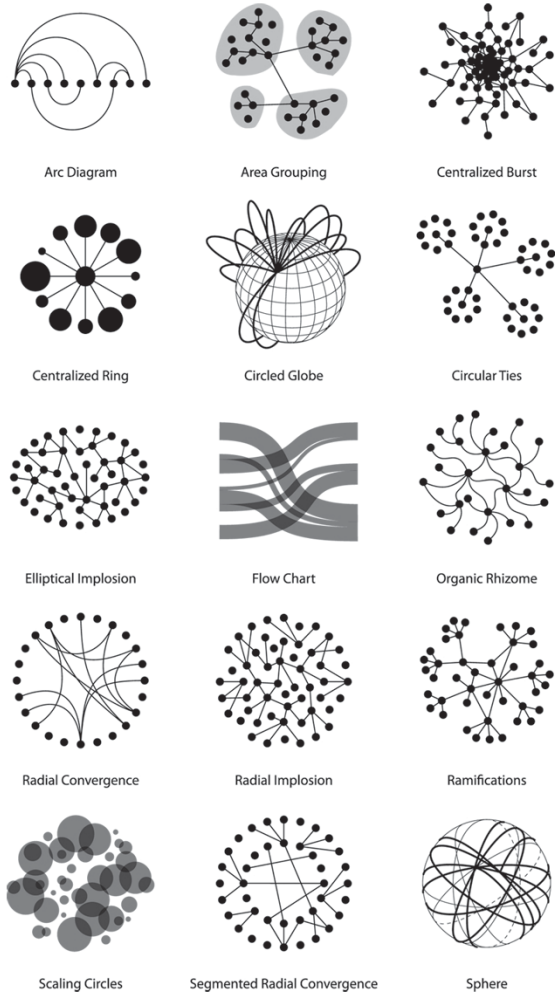


Figure 4. The Syntax of a New Language. Manuel Lima. *Visual Complexity: Mapping Patterns of Information*, 2011.

Causality

Visuals can also be powerful tools to illustrate chains of cause and effect in ecological processes, revealing correlations and causality. Links between elements can be illustrated and described visually, defining the active processes that link actors. Notation with specific meaning in network and causality diagrams enhances the communicative ability of these visualizations and supports systems thinking. Within systems, understanding is to 'know what cause provokes what effect, by what means, at what rate' (Tufte, 1997, p.9). Illustrations make this work especially accessible. A clear visualization of causality in environmental communication is the Architecture 2030's illustrations displaying sea-water rise in San Francisco and Boston (Figure 5). These visualizations illustrate the consequences of climate change and rising sea water levels. Another example of a visualization of causality is Tyler

During the last interglacial period, 125,000 years ago, when the earth was this warm (2 °C to 3 °C warmer), sea level was four to six meters higher than today.

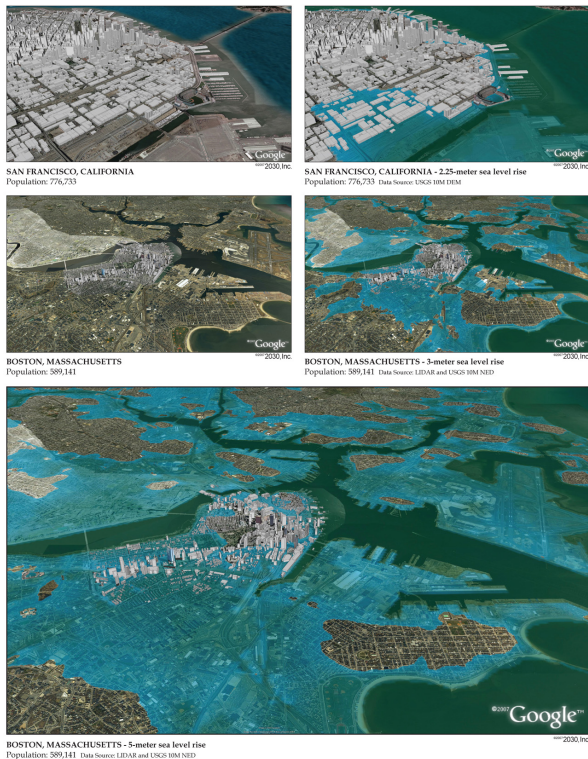


Figure 5. *Nation Under Siege. Sea Level Rise at Our Doorstep. A Coastal Impact Study.* Prepared by 2030 Inc. / [Architecture 2030](#), 2007.

Lang and Elsa Chaves' *Connecting the Dots: Climate Change & LEED* (Figure 6). Here the image maps the apparent connections between various factors driving climate change. This image is another good example of the highly politicized nature of environmental communication. By locating population growth as the central element in this graphic, the image reproduces the Malthusian assumption that population growth is the dominant factor in climate change. Historically, excessive consumption by wealthy countries has contributed far more carbon dioxide to the atmosphere than the nations with the majority of global population. Thus unsustainable development, not population, is the primary cause for climate change. This visual demonstrates how images can be used to facilitate causal analysis in environmental communication, but it also shows how images can propagate politically loaded perspectives that conceal the actual drivers of environmental problems.

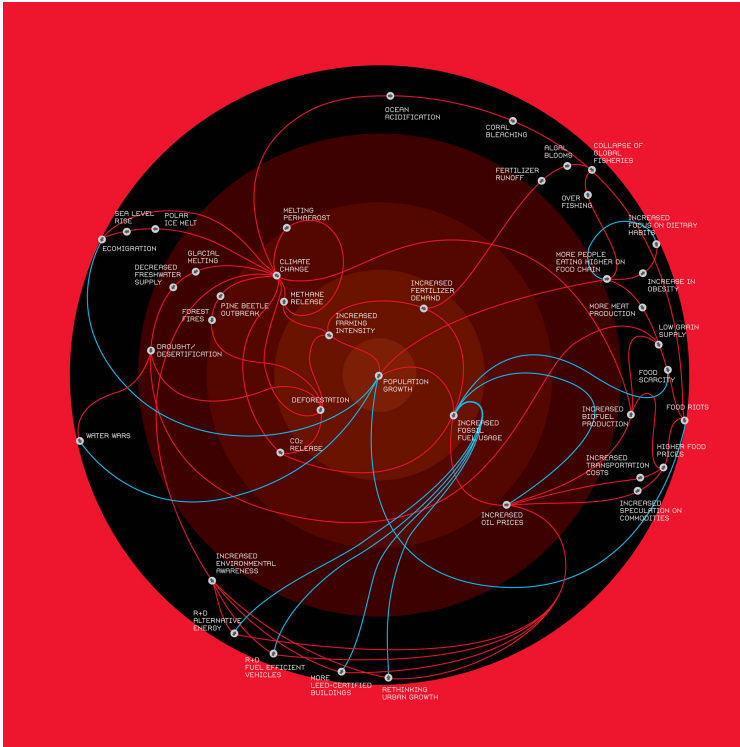


Figure 6. Connecting the Dots: Climate Change & LEED. Tyler Lang and Elsa Chaves.

Causality is complex within the Earth sciences and thus the environmental consequences of specific actions can often be impossible to predict with certainty. For this reason, images should also function to assist the representation of uncertainty in a manner that does justice to the potential dangers of unknown ecological consequences. Horn describes a role for the visual representations of unknowns by mapping the gaps in knowledge within environmental science thereby creating “unknown territory maps”. Focusing on unknown information serves to illustrate “the depth and breadth of our ignorance in this area so as to inform the debate about the precautionary principle” (Horn, 2005, p.2). Making unknowns explicit visually can enhance an understanding of the risk and unintended consequences.

Comprehensible Complexity and the Aesthetic Experience

In making new images designers must develop a balance between the presentation of complexity and comprehensibility while also creating an aesthetically compelling image. The communication of complexity becomes powerful when it is also meaningful to audiences. The aesthetic experience potentially provokes moments of insights where an observer feels a connection to the subject and the stark dualism of the Western epistemological tradition is interrupted. This experience can inspire self-reflective consciousness that not only intellectually understands ecological context, perceives the experience of interconnection. Strong aesthetic experiences are often equated with the temporary dissolution of the boundaries of self. Herein ecological relations can become an embodied sensation. Consequently, the celebrated aesthetic experience is potentially central to the emergence of ecological perception. Critically, this shift requires image-makers themselves to be aware of ecological relations to communicate this emergent knowledge. Furthermore, although aesthetic experiences can potentially foster deep learning and greater motivation for change than intellectual arguments, aesthetic experiences cannot be instrumentalized through a design strategy. Moments of insight, aesthetic experiences and ecological perception are

emergent phenomenon that cannot be controlled, but they can be nurtured. Designers can create the conditions for deep learning and aesthetic experiences, but these goals may remain illusive. Nevertheless, graphic design can challenge traditional ways of seeing and thinking by focusing attention on relational representations. Thus images are tools for ecological learning and also potential inspiring empathetic sensibilities in regards to human-nature relations.

Conclusion

Within the context of an increasingly visual culture, this paper proposes that graphic designers can encourage new ways of seeing and knowing to support both ecological perception and ecological literacy. Ecological perception is a building block for sustainability because “perception, consciousness, and behavior are all radically interdependent” (Sewall 1995, p.203). Thus the potential to nurture ecological perception through strategic image-making is a method to encourage learning to make ecological literacy possible. On the other hand, while images can be powerful learning tools, it is important to recognize that images will not necessarily work to support environmental learning. Without a critical stance, images can easily be used to promote anti-ecological behavior and ways of thinking. Images are equally useful at promoting rampant consumption and fragmenting individualism. Barry explains that it remains to be seen if visual media

...and the profound emotional power they tap and release will be the province of individual intelligence and cumulative social wisdom, or it will remain exclusively in the realm of special interests groups driven by short-sighted economic or other motives. Visual intelligence ultimately implies an understanding of the power of the visual image both to reveal and to reshape the world (1997, p.337).

While designers may want to encourage ecological ways of knowing, these priorities remain deeply challenging political problems. Revealing environmental circumstances and the impacts of industrial systems and consumer culture on the environment often involves confrontations with powerful vested interests and cultures of denial. Thus, like all matters in regards to sustainability, the onus of using intellectual and other resources toward the well being of people and planet sits at odds with the demands of short-term profit incentives. While images can facilitate social learning processes to make sustainability possible, presently a dominant role of images is their role of promoting conspicuous consumption (in advertising) and masking the consequences of industrial growth, i.e. greenwash. Due to the fact that representations of the environment are highly contested, the visual communication of ecological information must sit within an informed critique of the power dynamics behind the creation and reproduction of communication material.

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