Data Landscapes: a pragmatic and philosophical visualisation of the sustainable urban landscape

Tatjana Kecojević and Alan Derbyshire

School of Business, University of Central Lancashire
Preston, UK

School of Architecture, University of Manchester
Manchester, UK

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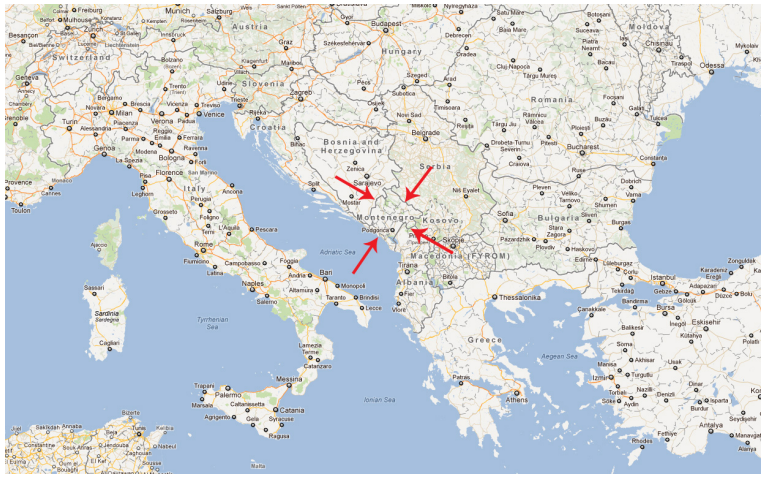
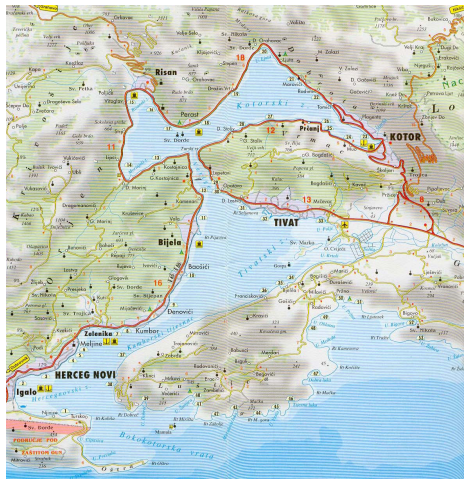
Sustainable Urban Landscapes





Aim

Establish a more accessible model of sustainable development that is able to inform all stakeholders in a coherent and well-organized framework mechanism.

- Explore the limitations of present sustainable indicators.
- Identify the fundamental components of resilient urban development.
- Develop a strategy of assessing and monitoring key elements of applicable benchmarks to the study region.
- Develop a communication device that bridges the gap between ecosystem health and simultaneously engages with local stakeholders and developers in facilitating resilience in existing and future urbanization projects.

Sustainability - A Matter of Definition

World Commission on Environment and Development (WCED) (also known as the Brundtland Commission) "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" is consistently referenced in relation to sustainable development. Though this is a useful over-arching catchphrase and a ubiquitous feature of many studies on the subject of sustainable development, it does not adequately chime with the complexities faced in implementing sustainable practice within the built environment.

Walker (2006) emphasises, defining sustainability is not a linear process.

According to Kunszt (2002), an architect would view the efficient utilisation of energy and resources as primary concerns.

Smith (2001) makes the point that the primary aim of the architect 'under the sustainability banner', is to heighten the comfort levels within buildings for their inhabitants.

Selman (2008) contends that the landscape may be defined in terms of its economic, social and political sustainability.

Antrop (2006) proposes that the whole notion of the sustainable landscape is open to contradiction as landscapes are continuously evolving 'in more or less a chaotic way' as they reflect social and economic needs.

Placeness – A Critical Component of Sustainability?

Establishing placeness is integral to the process of achieving genuine sustainable communities. Without an emotional connection there is no sense of ownership.

Elements of place-based theories are integral to notions of cultural identity, well-being and the resilience of communities and are therefore should be regarded as an integral feature of the sustainability equation.

Rating Systems

There are **two types of rating tools**:

- the criteria based assessment methods and
- the Life Cycle Assessment (LCA) based methods.

The Building Research Establishment Environmental Assessment Method (BREEAM) was established in 1990 as the first building environmental rating system and continues to act as an international standard for sustainability.

Criteria based assessment method:

- The Leadership in Energy and Environmental Design (LEED) rating system in the U.S.A.
- GBTool in Canada,
- Ecoprofile in Norway and
- Environmental Status in Sweden.

LCA methods

- The Leadership in Energy and Environmental Design (LEED) rating system is the U.S.A.?s version of the as is the
- Beat is the Danish version,
- Bees the American,
- KCL Eco in Finland and
- EcoQuantum in the Netherlands

One of the more culturally sensitive LCA methods is the Sustainable Project Appraisal Routine (SPeAR) devised by Arup in 2000 and released for licensing for its users in 2012.

Orientor Theory - Bossel

Any earthbound environmental and socio economic system can be characterised by six fundamental environmental properties.

- **Normal Environmental State**: The actual environmental state can vary around this state in a certain range.
- **Scarce Resources**: The information energy, and material resources required for a system?s survival are not immediately available when and where needed.
- **Variety**: Many qualitatively very different processes and patterns of environmental variables occur and appear in the environment constantly or intermittently.
- **Variability**: The normal environmental state fluctuates in random ways, and the fluctuations may occasionally take the environment far from the normal state.
- **Change**: In the course of time, the normal environmental state may gradually or abruptly change to a permanently different normal environmental state.
- **Other Systems**: The behaviour of other systems introduces changes into the environment of a given system.

(Bossel,1998)

Vernacular Ecosystem Index (VEI)

A vernacular ecosystem approach to resilience attempts to determine and draw upon the pragmatic and theoretical elements of the natural world.

The vernacular ecosystem methodology will be founded on a combination of vernacular principles, empirical and quantitative sustainable indicators and theory and place based philosophies.

The index will be applied to existing and future urban developments in the Boka Kotorska region to provide a critical visual and verifiable pointer to authentic resilient and sustainable outcomes.

By drawing attention to the spatial associations with vernacular the VEI aims to highlight the inter-connectedness with the broader cultural themes that are vital to ecosystem functioning and wider bioregional identity.

VEI components

Vernacular Ecosystem Index

In the spirit of Bossel's Indicator Theory

Assesses and rates new and existing developments based on ecosystem health

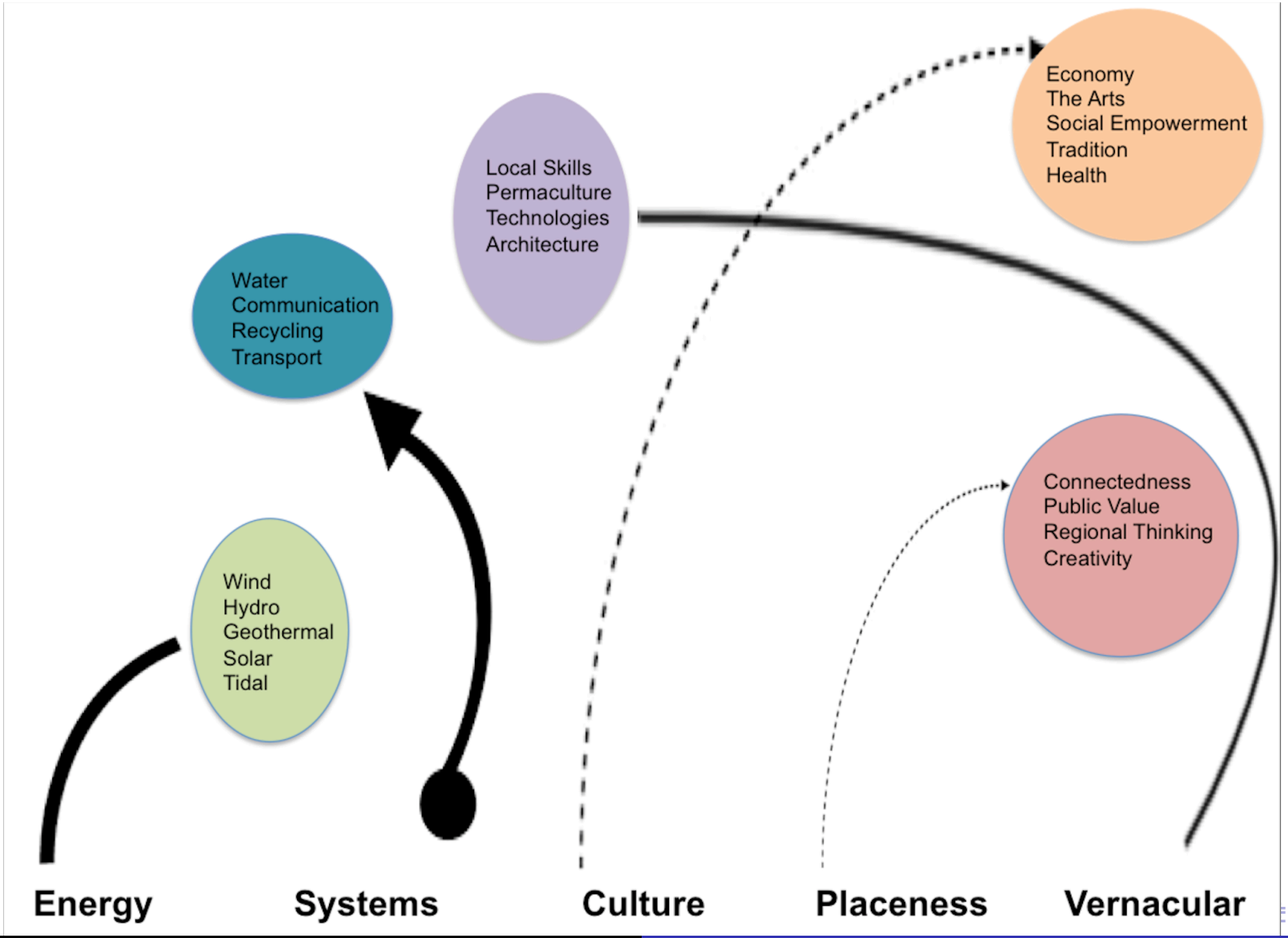
Pragmatic and easy to understand

Culturally accessible

VEI Components of Mutual Interaction

Energy Systems Culture Placeness Vernacular

VEI: reciprocal ecological process



ENERGY: Indicator Table

ENERGY

5	• Evidence of locally generated energy from renewable sources – primary source. • Evidence of established renewable 'feed in' schemes. • Evidence of established community sharing schemes. • Access to National renewable energy as a secondary source. • Significant evidence and utilisation of energy saving practices and devices.
4	• Evidence of locally generated energy from renewable sources – secondary source. • Evidence of prospective renewable 'feed in' schemes. • Some evidence of initiation of community sharing schemes. • Access to National renewable energy as a primary source. • Evidence and utilisation of energy saving practices and devices.
3	• Some Evidence of locally generated energy technology from renewable sources. • Some evidence of initiation of community sharing schemes. • Access to National renewable energy as a primary source. • Some evidence and utilisation of energy saving practices and devices.
2	• Isolated examples of locally generated energy technology from renewable sources. • Demonstrates effective energy conservation measures. • Access to National renewable energy as a primary source. • Isolated examples of energy saving practices and devices.
1	• Access to National renewable energy as a primary source, though if not available energy saving measures must be clear. • Isolated examples of energy saving practices and devices.

SYSTEMS: Indicator Table

SYSTEMS

5	• Evidence of significant water conservation and local supply sources. • Evidence of effective and efficient wastewater management. • Excellent communication networks. • Clear evidence of excellent pedestrian access, facilities. • Easy access to mass transit systems. • Established and fully functioning cycling facilities. • Clear evidence and usage of recycling programmes.
4	• Evidence of significant water conservation and local supply sources. • Evidence of effective and efficient wastewater management • Good communication networks. • Good pedestrian access, facilities. • Access to mass transit systems. • Good cycling facilities. • Recycling is a feature of project area.
3	• Evidence of water conservation and local supply sources. • Evidence of effective and efficient wastewater management • Adequate communication networks. • Adequate pedestrian access, facilities. • Access to mass transit systems. • Adequate cycling facilities. • Some evidence of recycling.
2	• Evidence of attempts at water conservation and local supply sources. • Evidence of effective and efficient wastewater management • Basic communication networks. • Basic pedestrian access, facilities. • Regional access to mass transit systems. • Some concessions to cycling.
1	• Evidence of attempts at water conservation and local supply sources. • Evidence of wastewater management. • Isolated evidence of communication networks. • Basic pedestrian access, facilities. • Regional access to mass transit systems.

CULTURE: Indicator Table

CULTURE

5	• Evidence of community interaction – informal sharing and trading of services and domestic produce, informal social gatherings, group forums etc. • Easy access to cultural forums – galleries, theatres, cinema, museums etc. • Evidence of local traditions – Food and drink, wine making, rakija distilling, cheese making etc. Song and dance. • Clear evidence of social empowerment - Structural barriers and facilitators to empowerment interventions need to be identified locally. • Evidence of entrepreneurship that builds on the notion of 'Wild Beauty' and the Ecological State. Employment in related enterprises. • Clear evidence of trading with neighbouring communities and beyond. • Easy access to healthcare • Evidence of new cultural events.
4	• Evidence of community interaction – informal sharing and trading of services and domestic produce, informal social gatherings, group forums etc. • Evidence of social empowerment - Structural barriers and facilitators to empowerment interventions need to be identified locally. • Access to cultural forums, though this may require transport. • Evidence of local traditions, though not as recurrent as level 5. • Evidence of entrepreneurship that indicates a potential to build on the twin concepts of Wild Beauty and Ecological state. • Access to healthcare, though this may require transport.
3	• Evidence of community interaction - informal sharing and trading of services and domestic produce, informal social gatherings, group forums etc. • Some evidence of social empowerment - Structural barriers and facilitators to empowerment interventions need to be identified locally. • Access to cultural forums, though this may require transport. • Evidence of entrepreneurship such as trading domestically produced products, local manufacturing etc. • Access to healthcare, though this may require transport.
2	• Some evidence of community interaction - informal sharing and trading of services and domestic produce, informal social gatherings, group forums etc. • Adequate healthcare facilities regionally. • Evidence of the beginning of social empowerment - enlisting community stakeholders in program improvement. • Regional access to cultural forums. • Beginnings of entrepreneurship – cooperatives, small traders etc.
1	• Some evidence of community interaction. • National access to cultural forums. • Potential for establishing entrepreneurship. • Evidence of the desire for social empowerment. • Adequate health regional/national.

PLACENESS: Indicator Table

PLACENESS

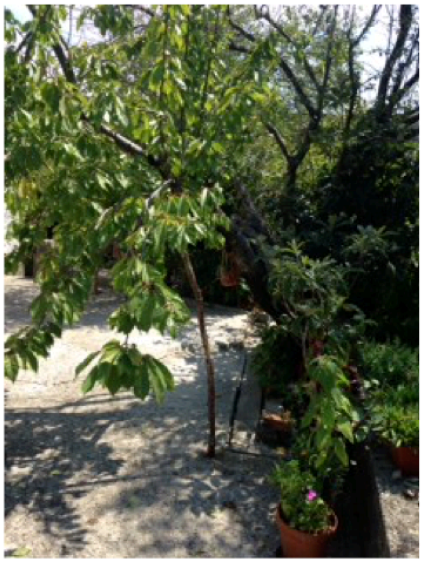
5	• Clear and established evidence of connectedness – urban form has clear visual, formal and natural connections with the local landscape. Construction materials are derived from local origins. • Clear evidence of innovative use of light and textures as a method of establishing ambience and connections to public spaces. • Evidence of public value – Commercial establishments that build on the values of community, ecological thinking – derivative regional products (non tourist), restaurants locally sourced menus. • Clear evidence of regional thinking – spaces and places that are significantly visually and formally related to other satellite features such as geological topography, landscape features and settlements. • Significant Evidence of creative activity – artists' studios, craft workshops, design in the community, youth projects.
4	• Evidence of connectedness – Urban form demonstrates visual formal and natural relationships to landscape. Materials are local in origin. • Good evidence of use of light and texture – local spaces. • Demonstrates the potential of public value – evidence of local goods trading. • Evidence of regional awareness – Local physical characteristics reflected in building form and public spaces. • Evidence that Artists, craftsmen and designers are significantly influencing the character of places and spaces.
3	• Some evidence of connectedness – Some clear references to physical features and local materials. • Some examples of designed lighting and texture in spaces and places. • Public value – evidenced by street trading, markets etc. • Regional awareness – Evidenced by formal representations in urban form. • The arts are beginning to be influential as a feature of the spaces and places.
2	• Some evidence of connectedness, though no clear connection with landscape. Materials look local, but are imported. • Isolated effective use of light and texture. • Beginnings of local commerce – street vendors etc. • Isolated evidence of regional awareness. • The arts begin to take a foothold.
1	• Limited connection with local landscape. Some visual references through material usage. • Isolated links to regional character

VERNACULAR: Indicator Table

VERNACULAR

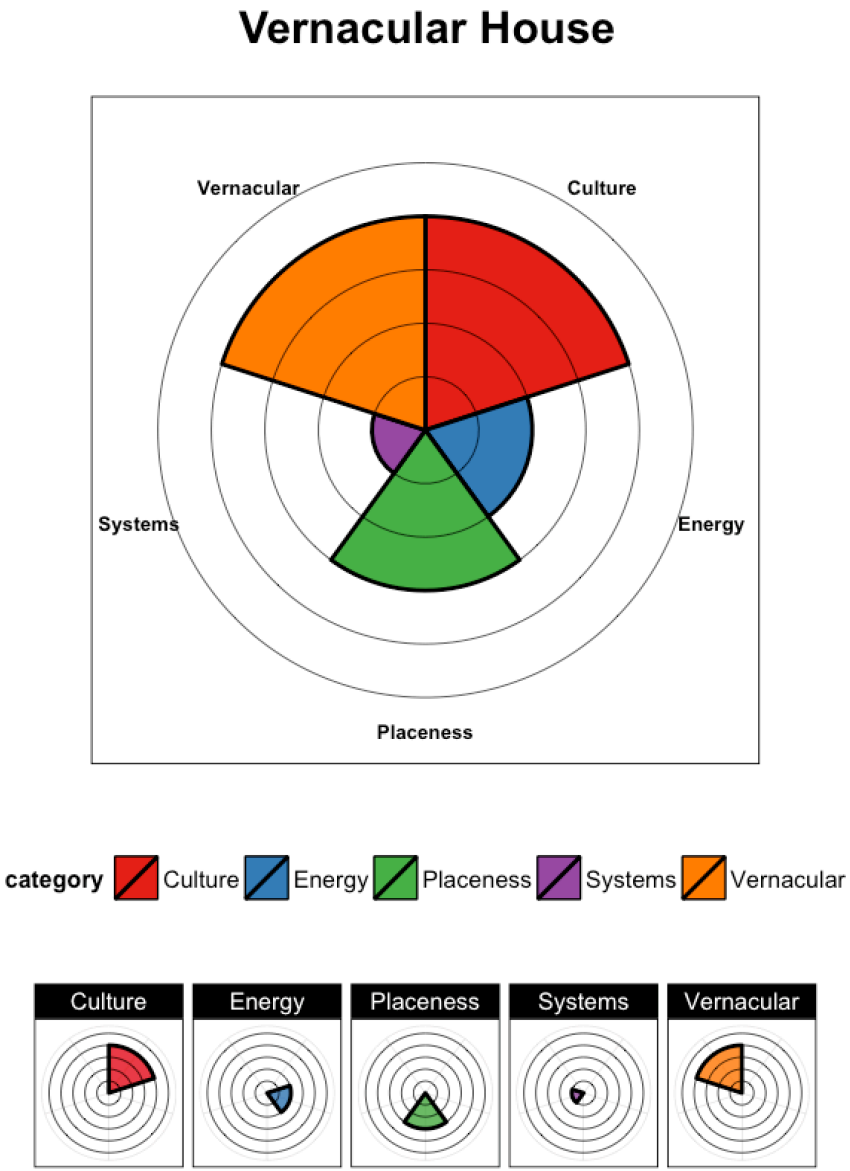
5	• Buildings and landscape are indicative of vernacular culture and are compatible with established vernacular principles. • Clear evidence of significant utilisation of local craft skills and practices. • Clear evidence of innovative application of vernacular species within and supported by architecture. • Significant usage of vernacular technologies or derivative bioclimatic devices within spatial and architectural forms. • Clear evidence of significant permaculture production and usage in spaces and places. • Clear evidence of innovative employment of architectural and spatial characteristics that are of direct benefit to local ecosystems.
4	• Buildings and landscape are indicative of vernacular culture and are compatible with established vernacular principles. • Clear evidence of significant utilisation of local craft skills and practices. • Clear evidence of innovative application of vernacular species within and supported by architecture. • Some usage of vernacular technologies or derivative bioclimatic devices within spatial and architectural forms. • Evidence of some permaculture production and usage in spaces and places. • Some employment of architectural and spatial characteristics or pilot schemes that are of direct benefit to local ecosystems.
3	• Building/s and landscape are indicative of vernacular culture. • Local Skills and practices are evident. • Good use of vernacular species in spatial settings • Vernacular technologies are evident.
2	• Building/s and landscape are indicative of vernacular culture. • Isolated evidence of local skills and practices. • Some usage of vernacular species.
1	• Building/s and landscape are indicative of vernacular culture. • Some usage of vernacular species.

Case Study



Vernacular House

VEI Rose Chart



ggplot2: VEI Rose Chart

```
rm(list=ls())
library(ggplot2)
#=======================================
# Rose Chart ============================
#=======================================
category <- c("Culture", "Energy", "Placeness", "Systems", "Vernacular")
score <- c(0, 0, 0, 0, 0)
myd <- data.frame(category, score)

ggplot(myd, aes(category, weight=score, fill = category)) + geom_bar(width = 1, color=1, lwd=0.8)

last_plot() + scale_fill_brewer(palette = "Set1") + geom_hline(yintercept=seq(0, 5, by=1), colour =
 "black", size = 0.2) + scale_y_continuous(breaks = 0:5) + theme_linedraw() + coord_polar()  + labs(x = "",
 y = "") + theme(panel.grid.major = element_line(color="white", size=0.2), legend.position = "bottom",
 axis.ticks.y=element_line(size=0), axis.ticks = element_blank(), axis.text.x=element_text(size=8,
 face="bold"),  axis.text.y=element_text(size=0))
#
#=======================================
# Rose Chart Segments ==================
#=======================================
quartz()
ggplot(myd, aes(category, weight=score, fill = category)) + geom_bar(width = 1, alpha=.85, color=1,
 lwd=0.8)

last_plot() + scale_fill_brewer(palette = "Set1") + geom_hline(yintercept=seq(0, 5, by=1), colour =
 "black", size = 0.2) + scale_y_continuous(breaks = 0:5) + theme_linedraw() + coord_polar()  + labs(x = "",
 y = "") + theme(panel.grid.major = element_line(color="gray", size=0.1), legend.position = "none",
 axis.ticks.y=element_line(size=0), axis.text.x=element_text(size=0),  axis.text.y=element_text(size=0)) +
 facet_wrap( ~ categoryry, ncol = 5)
```

VEI Regional Appraisal

ggmap: VEI Regional Appraisal

```
#=====================================
# Google Maps ========================
#=====================================
library(ggmap)

MNG <- read.csv("MNG_VEI.csv", header=T)

map <- get_map(location = c(lon = 18.653106, lat = 42.4653106), zoom = 11)
ggmap(map)

last_plot() + geom_point(aes(x = long, y = lat, size = score-1.5, alpha=score), data=MNG, colour="maroon1")
 + theme(axis.text.x=element_text(size=0),  axis.text.y=element_text(size=0), axis.ticks = element_blank(),
 legend.position = "none", axis.title=element_text(size=0))
```

VEI App

Vernacular Ecology Index - VEI

Please input the scores for the five VEI categories.

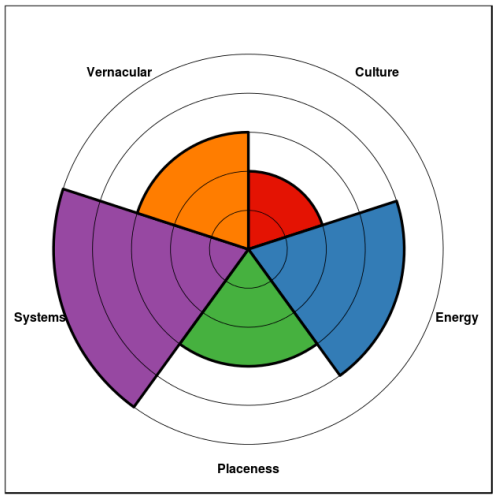
Culture: 2

Energy: 4

Placeness: 3

Systems: 5

Vernacular: 3



shiny: VEI App

server.R* | ui.R

Reload App

```
1  shinyUI(fluidPage(
2    titlePanel(h2("Vernacular Ecology Index - VEI")),
3
4    sidebarLayout(
5
6      sidebarPanel(h5("Please input the scores for the five VEI categories."),
7
8            sliderInput("slider_c",
9                        label = h5("Culture:"),
10                       min = 0, max = 5, value = c(0), step = 1, round =1, width = "150px"),
11
12           sliderInput("slider_e",
13                       label = h5("Energy:"),
14                       min = 0, max = 5, value = c(0), step = 1, round =1, width = "150px"),
15
16           sliderInput("slider_p",
17                       label = h5("Placeness:"),
18                       min = 0, max = 5, value = c(0), step = 1, round =1, width = "150px"),
19
20           sliderInput("slider_s",
21                       label = h5("Systems:"),
22                       min = 0, max = 5, value = c(0), step = 1, round =1, width = "150px"),
23
24           sliderInput("slider_v",
25                       label = h5("Vernacular:"),
26                       min = 0, max = 5, value = c(0), step = 1, round =1, width = "150px")
27   ),
28
29   mainPanel(
30     plotOutput("myplot")
31   )
32
33   )
34
35 ))
```

36:1 (Top Level) R Script

shiny: VEI App

server.R* | ui.R

Reload App

```
2  library(ggplot2)
3
4  shinyServer(function(input, output) {
5
6      output$myplot <- renderPlot({
7
8      category<-c("Culture", "Energy", "Placeness", "Systems", "Vernacular")
9      score <- c(input$slider_c, input$slider_e, input$slider_p, input$slider_s, input$slider_v)
10     myd<-data.frame(category, score)
11
12     ggplot(myd, aes(category, weight=score, fill = category)) + geom_bar(width = 1, color=1, lwd=0.8)
13     + scale_fill_brewer(palette = "Set1") + geom_hline(yintercept=seq(0, 5, by=1), colour = "black", size = 0.2)
14     + scale_y_continuous(breaks = 0:5) + theme_linedraw() + coord_polar()
15     + labs(x = "", y = "") + theme(panel.grid.major = element_line(color="white", size=0.2),
16     legend.position = "bottom", axis.ticks.y=element_line(size=0), axis.ticks = element_blank(), axis.text.x=element_text(size=8, face="bold"),
17     axis.text.y=element_text(size=0))
18     })
19
20
```

23:6 <function>(input, output) R Script

- https://vei13.shinyapps.io/VEI13/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