SUPPLEMENTARY MATERIAL TO: Buschke et al. S Afr J Sci. 2021;117(5/6), Art. #9298.

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```
# This R-script includes all the code required to replicate
# the figures:

# First, read in a response ('resp') matrix with the NEMA
# principles as columns, and each respondent's response as
# rows. All rows sums equal three, since each respondent
was #only allowed to select three principles.

resp <- matrix(c(1,0,1,0,0,0,0,0,0,0,1,0,0,
                 0,0,1,0,0,0,1,1,0,0,0,0,0,0,
                 0,0,1,1,0,0,0,0,0,0,0,0,0,1,
                 0,1,0,0,0,0,1,0,0,1,0,0,0,0,
                 0,0,0,0,0,0,0,0,1,0,0,1,1,0,
                 0,0,1,0,0,1,1,0,0,0,0,0,0,0,
                 1,0,0,0,0,1,0,0,0,0,1,0,0,0,
                 0,0,0,1,0,0,0,1,0,1,0,0,0,0,
                 0,1,0,0,1,0,0,0,0,0,0,1,0,0),nrow=9,byrow=T)


# This adds columns names to the matrix, which describe the
# NEMA principles.

colnames(resp) <- c(
"2(2): Place people at the forefront of environmental management.",
"2(3): Social, environmental and economic sustainability.",
"2(4)a: Long-term risk aversion and the mitigation hierarchy, ",
"2(4)b: Environmental management must be integrated.",
"2(4)c: Environmental justice without unfair discrimination.",
"2(4)d: Equitable access to meet human needs.",
"2(4)f: Participation of all interested and affected parties.",
"2(4)g: Consider the interests, needs, and values of affected parties.",
"2(4)h: Education and awareness for community wellbeing.",
"2(4)k: Decisions must be open and transparent.",
"2(4)o: The environment is held in public trust for the people.",
"2(4)p: Costs must be paid by those responsible.",
"2(4)q: The role of woman and youth in environmental management.",
"2(4)r: Specific attention to sensitive and vulnerable ecosystems.")


# This adds labels that include italic text
labs <- c(
expression("2(2): Place people at the forefront of environmental
management."),
expression("2(3): Social, environmental and economic sustainability."),
expression("2(4)"~italic(a)~": Long-term risk aversion and the mitigation
hierarchy."),
expression("2(4)"~italic(b)~": Environmental management must be
integrated."),
expression("2(4)"~italic(c)~": Environmental justice without unfair
discrimination."),
expression("2(4)"~italic(d)~": Equitable access to meet human needs."),
expression("2(4)"~italic(f)~": Participation of all interested and affected
parties."),
expression("2(4)"~italic(g)~": Consider the interests, needs, and values of
affected parties."),
expression("2(4)"~italic(h)~": Education and awareness for community
wellbeing."),
```

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expression("2(4)"~italic(k)~": Decisions must be open and transparent."),
expression("2(4)"~italic(o)~": The environment is held in public trust for
the people."),
expression("2(4)"~italic(p)~": Costs must be paid by those responsible."),
expression("2(4)"~italic(q)~": The role of women and youth in environmental
management."),
expression("2(4)"~italic(r)~": Specific attention to sensitive and
vulnerable ecosystems."))



# The cluster analysis requires the 'vegan' package in R.
# First install the package and then load it to the session

#install.packages("vegan")

library(vegan)

#########################################################################
#########################################################################

# Save Figure 1 in the working directory as a PNG file.

#png(filename="Figure1.png", width=16,height=10,units="cm",res=300)

# PDF if needed
#pdf("Figure1.pdf",width = 6.299, height =3.937 )


# Set plot dimensions
par(mai=c(0.8,3.8,0.1,.1))

# Make a horizontal barplot of the frequency of NEMA pronciples.
x<- barplot(rev(colSums(resp)), mgp=c(2.2,0.6,0),horiz=T, las=1,
      cex.names=0.7,xlab="Frequency", xlim=c(0,4.5), yaxt='n')

mtext(labs, side = 2, line = 0.4, outer = FALSE, at = rev(x[,1]),las=1, cex=0.7)

box() # Add bounding box

dev.off() # Close plot device and save file

#########################################################################
#########################################################################

# Save Figure 2 in the working directory as a PNG File

png(filename="Figure2.png", width=16,height=10,units="cm",res=300)

# PDF if needed
pdf("Figure2.pdf",width = 6.299, height =3.937 )


# This clusters the data and saves it as a dendrogram based on:
  # - Euclidean distance,
  # - Ward's amalgamation rule

orig.clust <- hclust(vegdist(t(resp),"euclidean"), "ward.D2")
clust <- as.dendrogram(orig.clust)
```

```
# The following function identifies nodes in the cluster dendrogram and
# assigns each its own colour.

colbranches <- function(n, col)  {
  a <- attributes(n) # Find the attributes of current node
  # Color edges with requested color
  attr(n, "edgePar") <- c(a$edgePar, list(col=col, lwd=1.25))
  n # Don't forget to return the node!
  }

# Create a cluster object (called 'clust2') and define it as a dendrogram
clust2 <- as.dendrogram(as.hclust(clust), hang = 0.35)

# Color the first branch in black,
clust2[[1]] = dendrapply(clust2[[1]], colbranches, "black")

# Color the second branch in grey,
clust2[[2]] = dendrapply(clust2[[2]], colbranches, "darkgrey")

# Use the 'dendextend' package to re-lable the dendrogram nodes

#install.packages("dendextend")

library("dendextend")

labels(clust2) <- labs[orig.clust$order]

# Set margins for plot
par(mai=c(0.7,0.1,0.1,3.9))

# This plots the cluster dendrogram
plot(clust2, center=F,las=1, xlab="Euclidean dissimilarity",horiz=T,
      edgePar = list(col = 2:3),
      nodePar = list(lab.cex = 0.75, pch = NA), mgp=c(1.8,0.6,0),
      edge.root =T, main = "")

dev.off() # Close plot device and save file
```