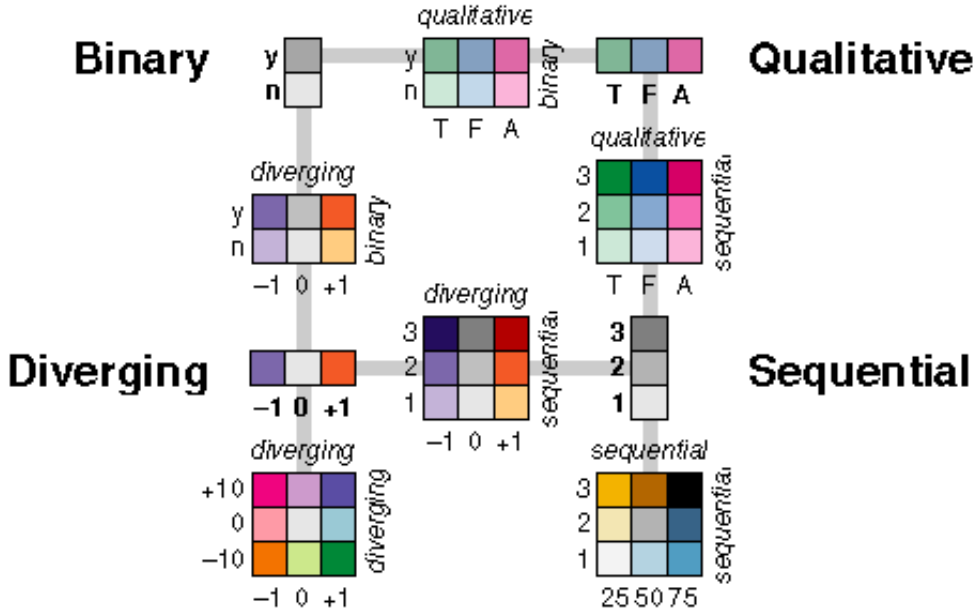
Color Use Guidelines for Mapping and Visualization

Cynthia Brewer

Color Scheme Types and Combinations: Overview

Select the color scheme of interest below to see examples of it in use.



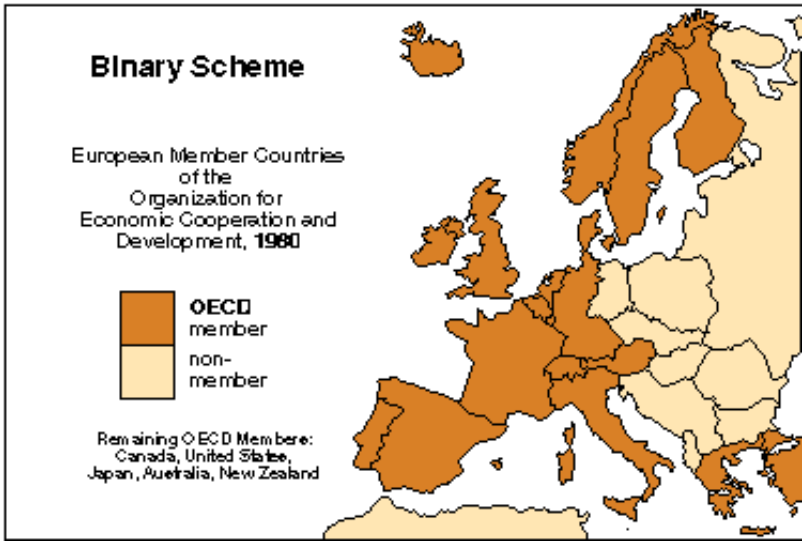
Go back to Cindy's page or PSU Geography or GeoVISTA

Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Binary Color Schemes

Binary schemes show nominal differences that are divided into only two categories. The primary perceptual difference between the two categories of a binary scheme may be a lightness step, unlike the use of hue for multi-valued qualitative variables. Incorporated versus unincorporated urban areas are well represented by a binary color scheme.

Binary Color Scheme Example



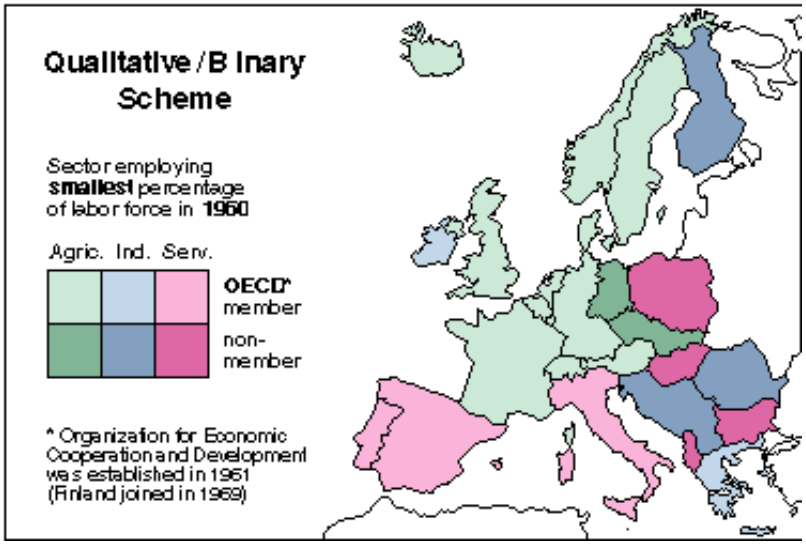
...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Qualitative Binary Color Schemes

In qualitative/binary schemes, light and dark versions of each hue of the qualitative variable correspond to the binary variable categories. Binary/binary schemes are a subset of the qualitative/binary schemes with one binary difference represented by a hue difference and the other by a lightness difference. A multi-hued vegetation map (qualitative) with darker hues for vegetation on public lands and lighter hues for vegetation on private lands (binary) is well suited by a qualitative/binary color scheme.

Qualitative Binary Color Example



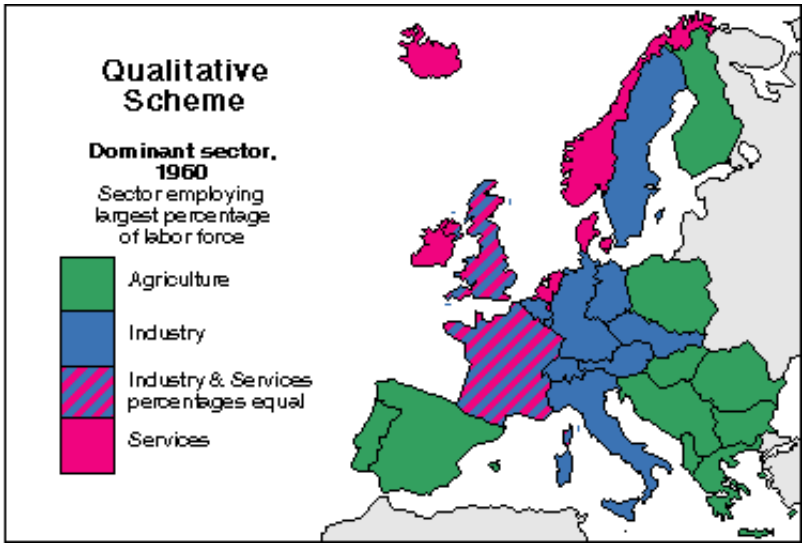
...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

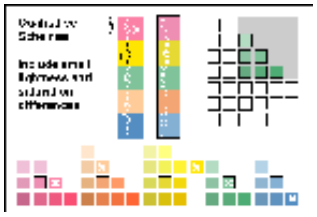
Qualitative Color Schemes

Qualitative schemes use differences in hue to represent nominal differences, or differences in kind. The lightness of the hues used for qualitative categories should be similar but not equal. Assign the lightest, darkest, and most saturated hues in the scheme to categories that warrant emphasis on the map. Data about land use or land cover, for example, are well represented by a qualitative color scheme.

Qualitative Color Example



Qualitative Color Schemes: Munsell Charts



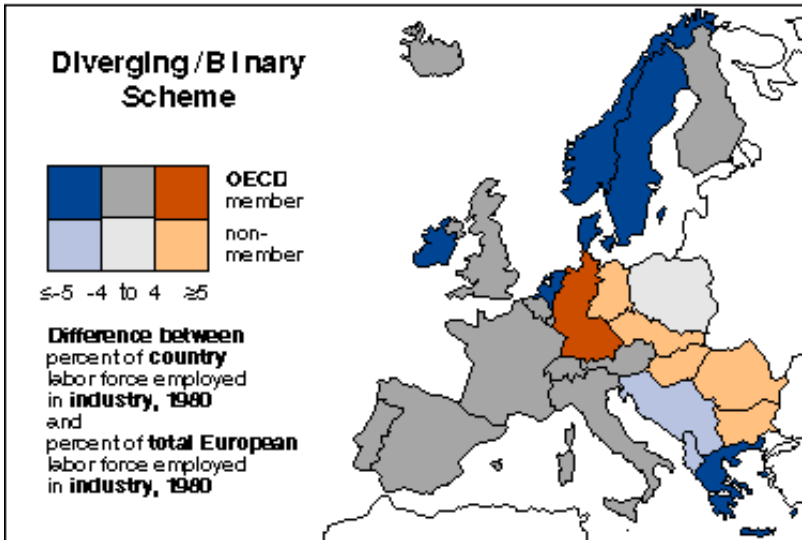
...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

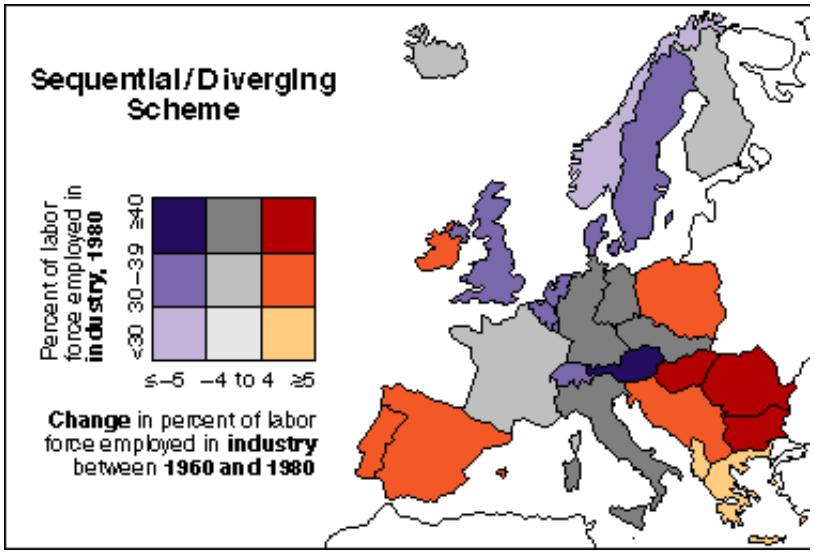
Diverging Binary and Diverging Sequential Color Schemes

Diverging/binary and diverging/sequential schemes have the same perceptual characteristics. The success of the schemes hinge on the large contrast range available in the lightness dimension. Large lightness steps are used for the binary or sequential variable. Smaller lightness steps, that are bolstered by a change in hue, represent the diverging component of the scheme within each large lightness step of the comparison variable. For example, data on cancer rates above and below a mean rate (diverging) and air pollution levels (sequential) are well represented by a diverging/sequential color scheme.

Diverging Binary Color Example



Diverging Sequential Color Example



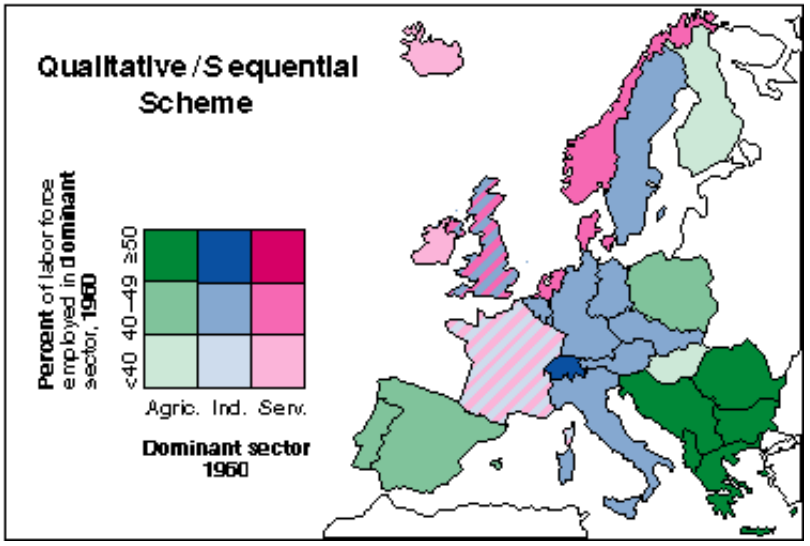
...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Qualitative Sequential Color Schemes

In qualitative/sequential schemes, the qualitative variable is represented with hues and the quantitative variable is represented with sequences of lightness steps within each hue. Binary/sequential schemes are a subset of qualitative/binary schemes with the binary variable represented by a hue difference and lightness differences reserved for the sequential variable. Population percentages (sequential) of varied dominant ethnic groups or religions (qualitative), for example, are well represented by a qualitative/sequential color scheme.

Qualitative Sequential Color Example



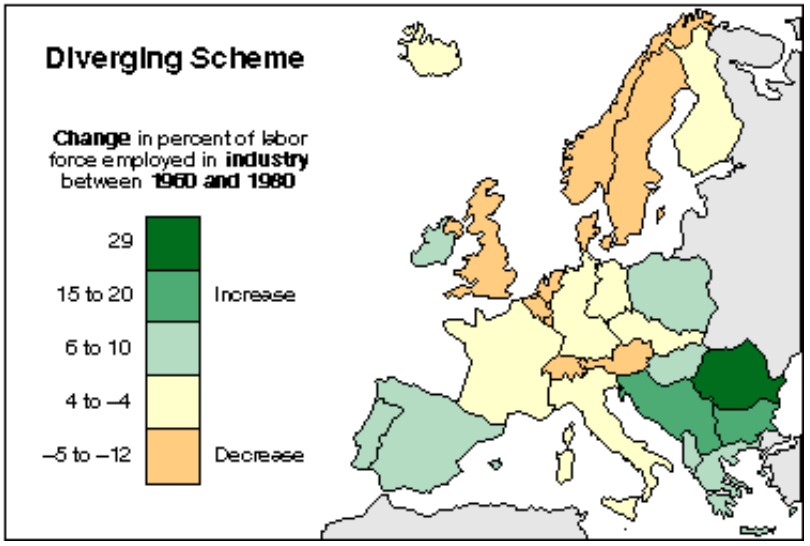
...back to Color Scheme Types and Combinations: Overview

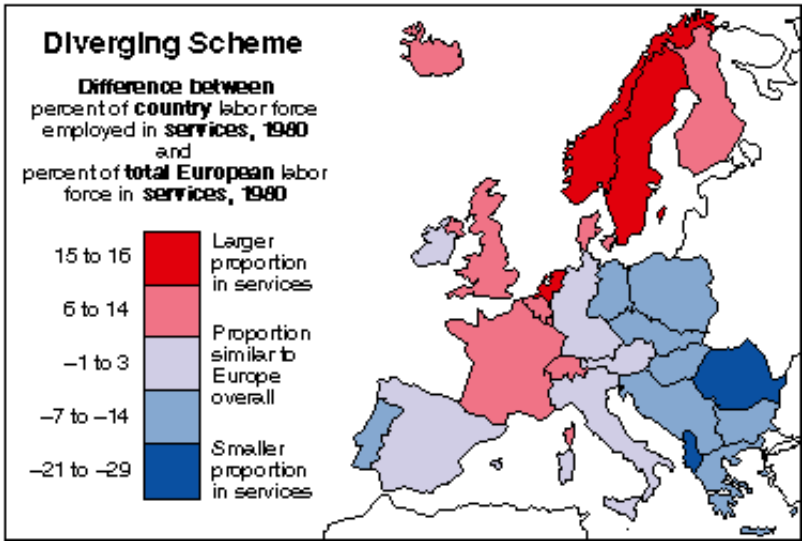
Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Diverging Color Schemes

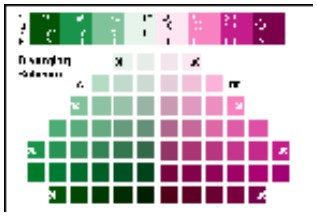
Diverging schemes allow the emphasis of a quantitative data display to be progressions outward from a critical midpoint of the data range. A typical diverging scheme pairs sequential schemes based on two different hues so that they diverge from a shared light color, for the critical midpoint, toward dark colors of different hues at each extreme. Deviations above and below the median death rate from a disease, for example, are well represented by a diverging color scheme.

Diverging Color Examples





Diverging Color Schemes: Munsell Charts



...back to Color Scheme Types and Combinations: Overview

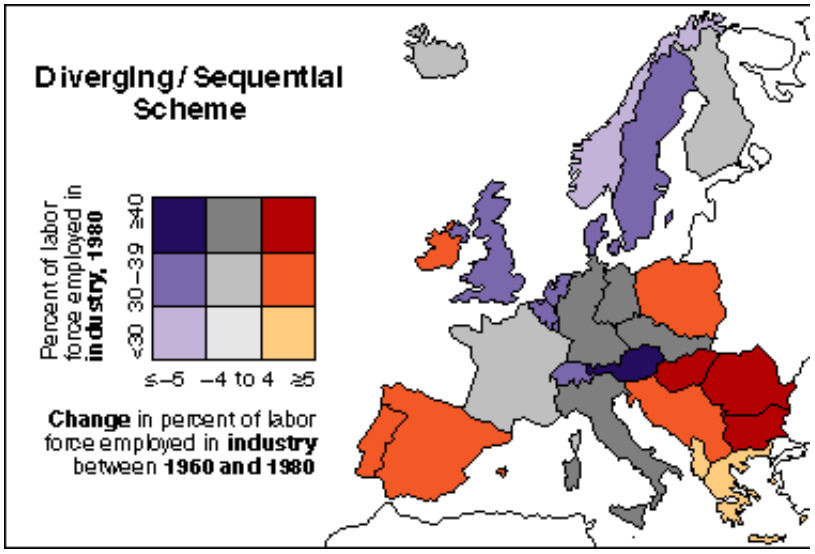
Go back to Cindy's page or PSU Geography or GeoVISTA

Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Diverging Sequential Color Schemes

Diverging/sequential schemes use a direct overlay of the component one-variable schemes.

Diverging Sequential Color Example



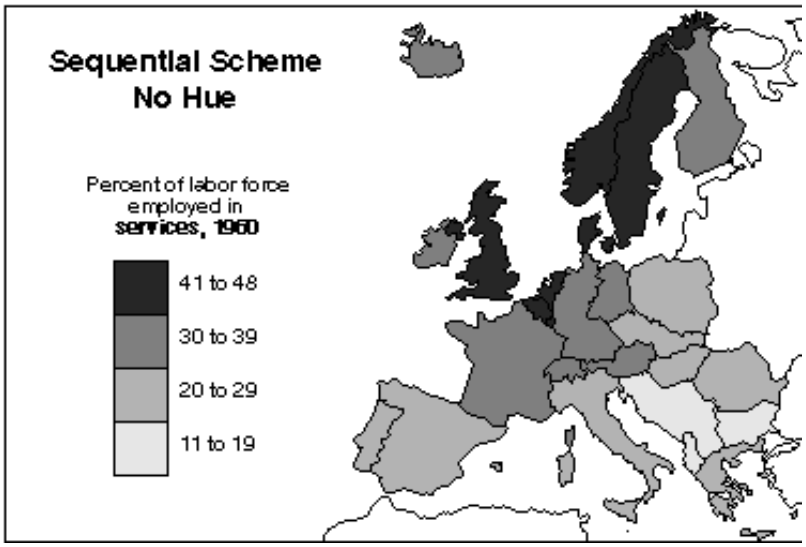
...back to Color Scheme Types and Combinations: Overview

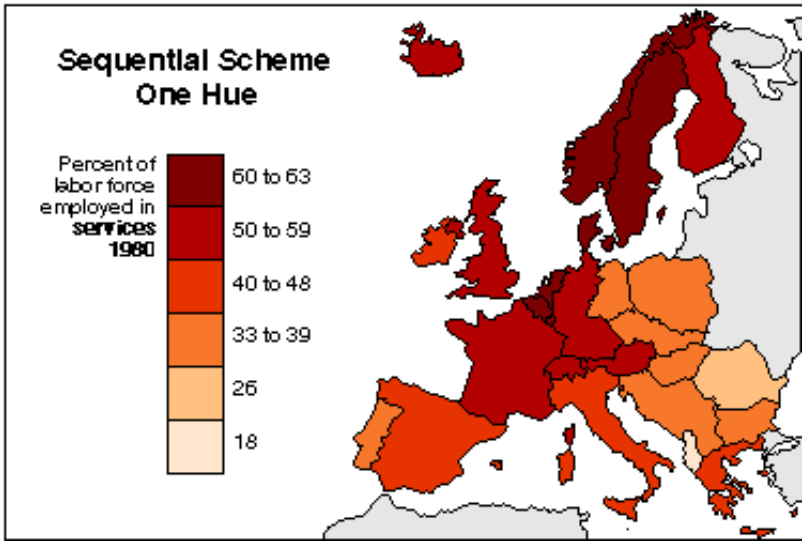
Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

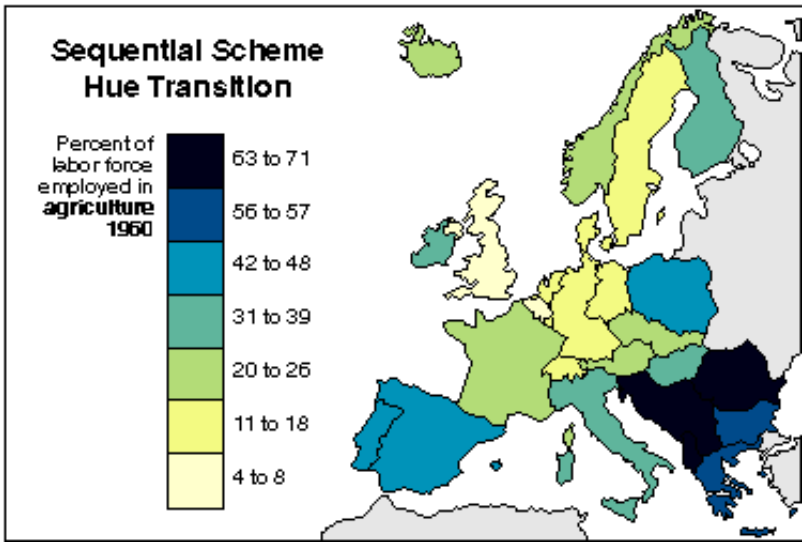
Sequential Color Schemes

Sequential data classes are logically arranged from high to low, and this stepped sequence of categories should be represented by sequential lightness steps. Low data values are usually represented by light colors and high values represented by dark colors. Transitions between hues may be used in a sequential scheme, but the light-to-dark progression should dominate the scheme. Terrain slope categories or population densities, for example, are well represented by sequental color schemes.

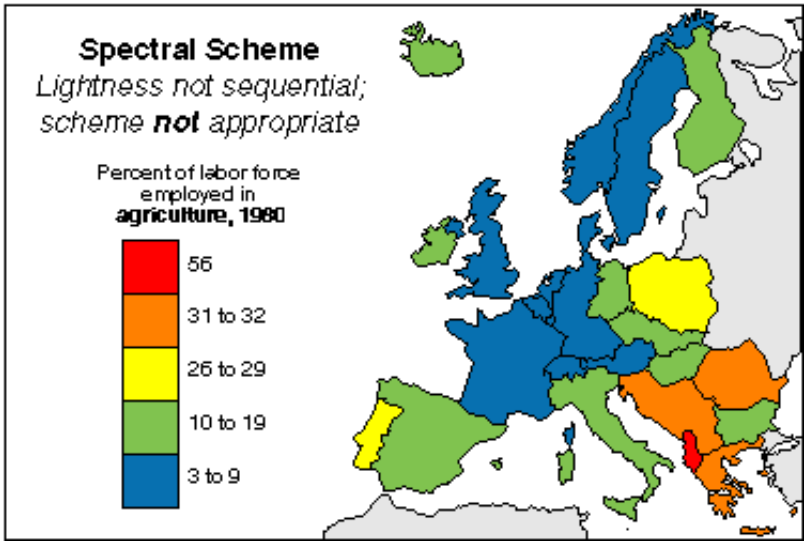
Sequential Color Example





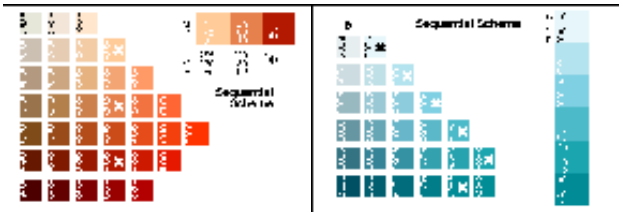


Spectral (rainbow) schemes are not suitable for seqential data.



Spectral schemes are suitable as diverging schemes (see other examples of diverging schemes). For example, if mean employment was 27.5 percent, the scheme above would appropriately emphasize differences from the middle class.

Sequential Color Schemes: Munsell Charts



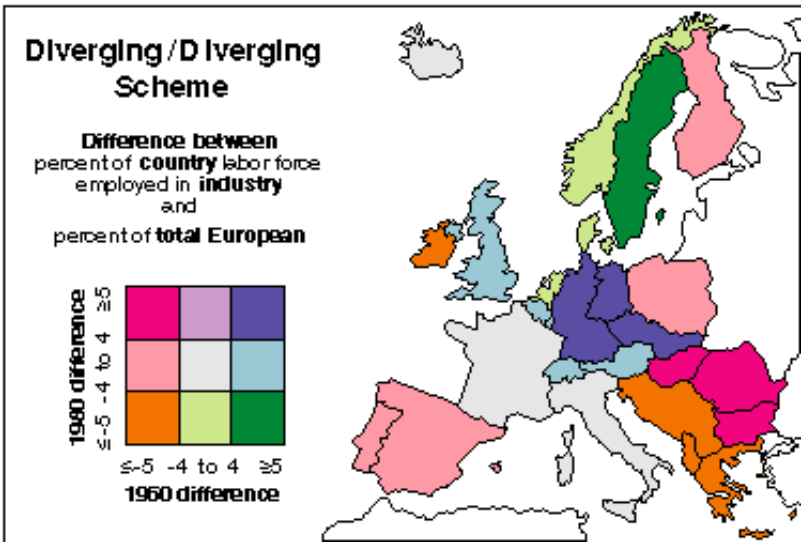
...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

Diverging Diverging Color Schemes

Diverging/diverging schemes are the only two-variable schemes that depart from the idea of a direct overlay of the component one-variable schemes. Place a different moderately-dark hue at each of the four corners of the legend. These four hues represent categories that are extremes for both variables. Place a very light or white color at the center of the legend, creating an appropriately light color for the class that contains the critical value or midpoint of both variables. The remaining colors are lighter than the corners, because they contain the midpoint of one of the two variables, and they are transitional hues that lie between their adjacent hues. The color circle is essentially stretched around the perimeter of the legend and lightness adjusted in response to critical values within the data ranges of both variables. Areas above and below the poverty line in 1960 and 1990, for example, are well represented by a diverging/diverging color scheme.

Diverging Diverging Color Example



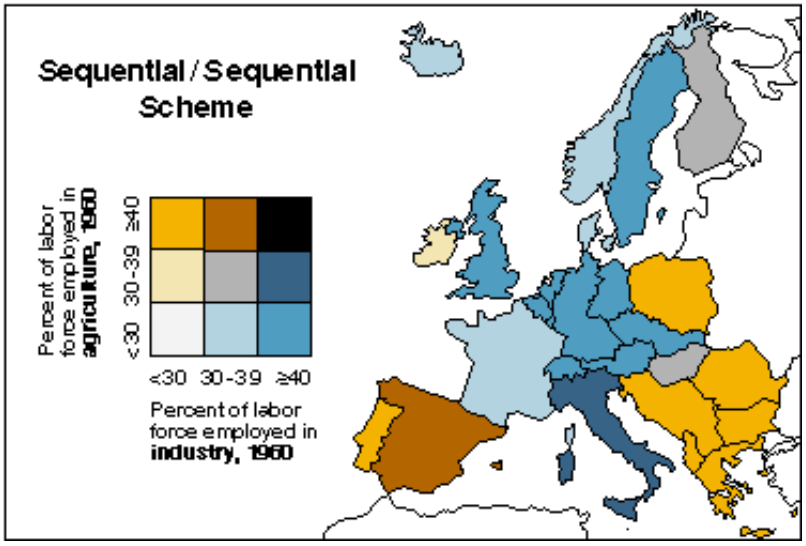
...back to Color Scheme Types and Combinations: Overview

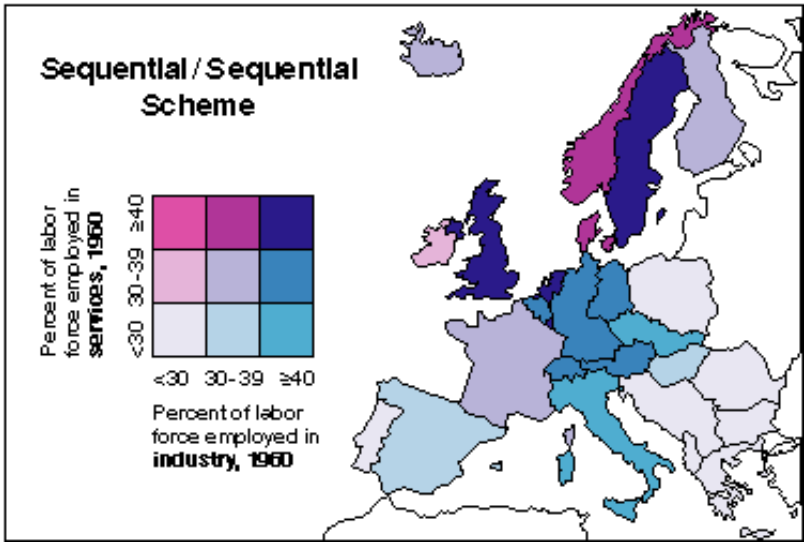
Go back to Cindy's page or PSU Geography or GeoVISTA
Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University

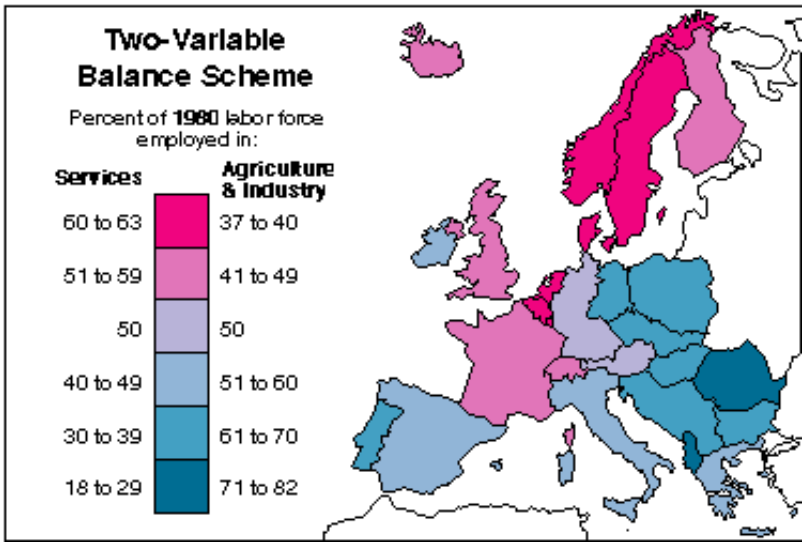
Sequential Sequential Color Schemes

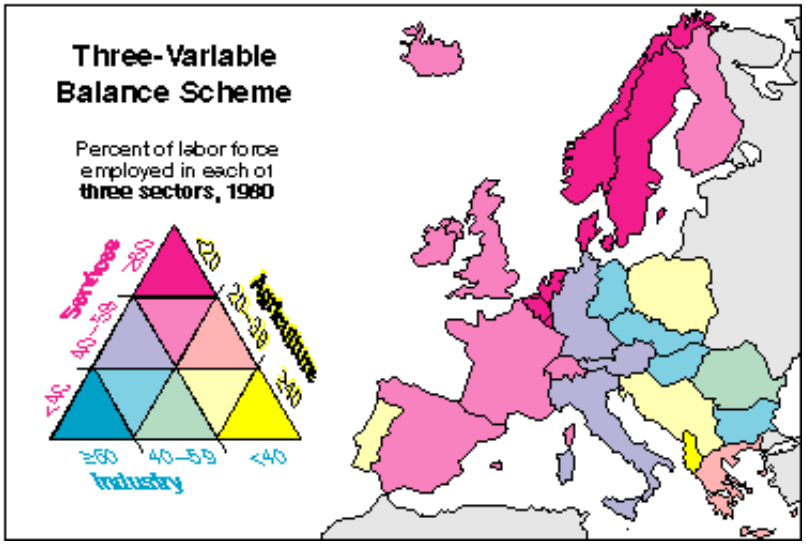
Sequential/sequential schemes are the logical mix of all combinations of the colors in two sequential schemes. Thus, the schemes are based on two hues. The hue mixtures may form a third hue (magenta and cyan sequences produce a variety of transitional purple-blues). If the two hues crossed are approximate complements, their mixtures produce a neutral gray diagonal and desaturated transitional colors. Systematic lightness differences throughout the scheme are important; do not depend on hue to impart the magnitude message. Use hue transitions to designate differences in proportions of the two variables mapped. For example, data on educational attainment crossed with crime rate categories are well represented by a sequential/sequential color scheme.

Sequential Sequential Color Examples









...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA

Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University