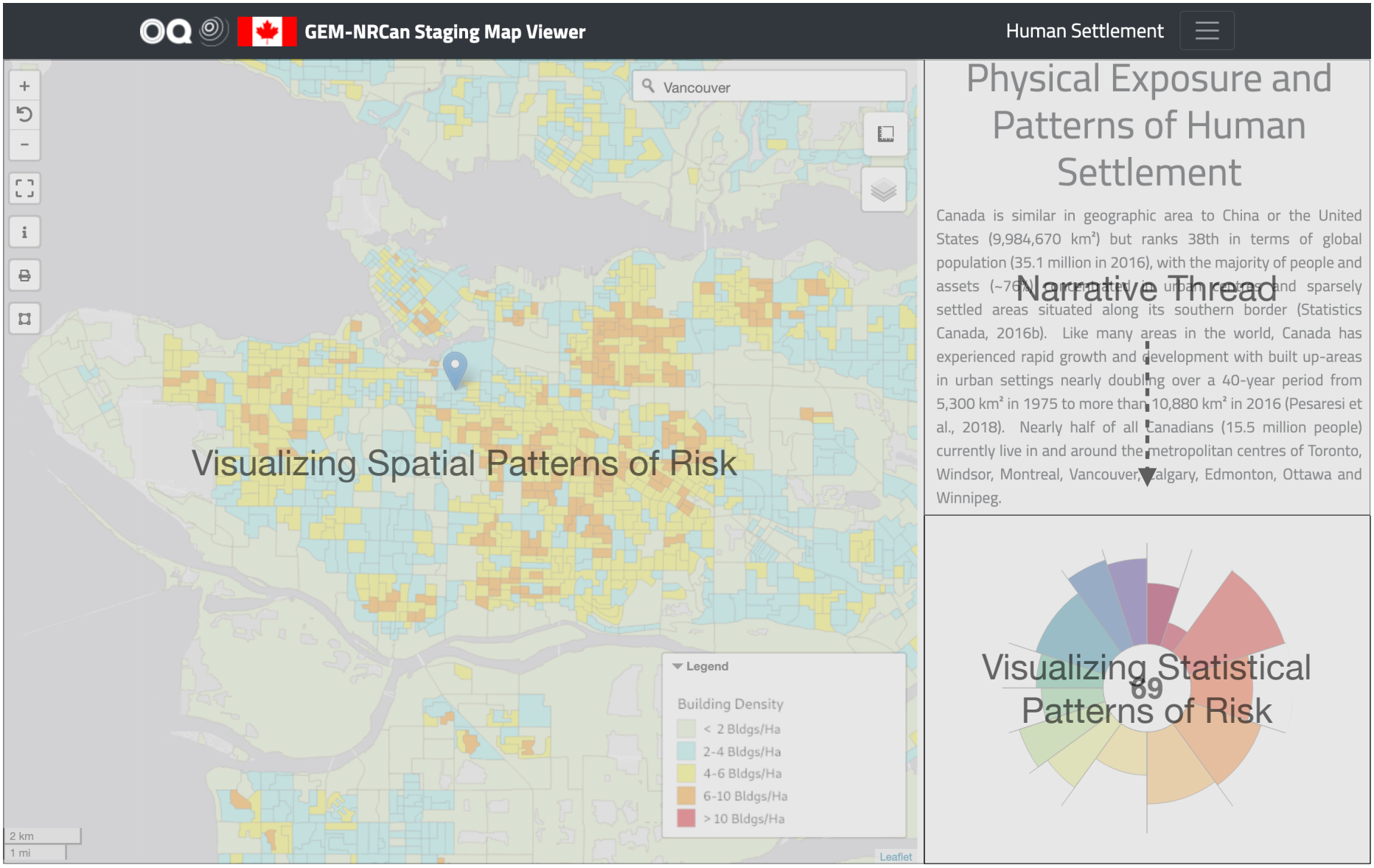
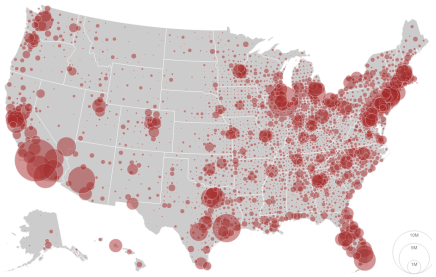
Using InfoViz to Develop a Shared Understanding of Risk



References
From Data to Viz: https://www.data-to-viz.com/
Observable: https://observablehq.com/@mbostock
D3.js Graph Gallery: https://www.d3-graph-gallery.com/index.html

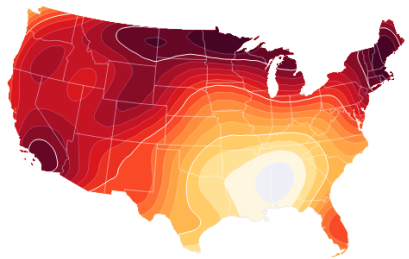
Visualizing Spatial Patterns of Risk

Bubble Map

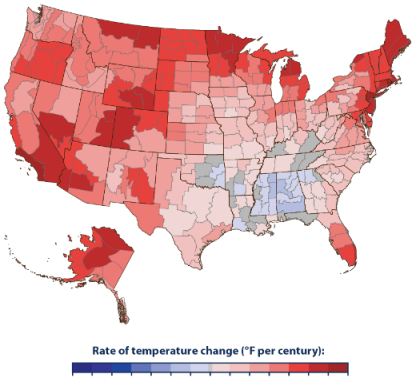


Purpose: Visualize site-level point data for a given location at variable scales of resolution. Attribute data (buildings, people and/or assets) are represented as circles that are scaled according to corresponding numeric values. Used to represent aggregated and/or nested disaggregated values at a given location.
Example Indicator: Number of buildings likely to be damaged beyond repair, with potential to disaggregate by tag values (construction, occupancy, etc)
User Interaction: User can retrieve attribute information for a given location by clicking on map features and can filter point data based on tag values in legend and/or corresponding charts
Code Samples:
• https://observablehq.com/@olemi/mapping-data-on-openstreetmap-using-leaflet
• https://observablehq.com/@d3/bubble-map

Contour Density Map

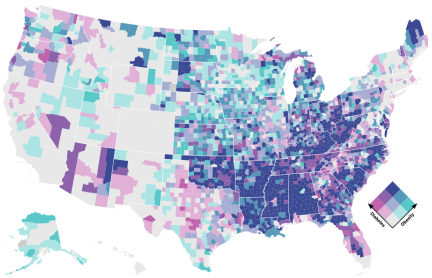


Purpose: Visualize generalized patterns of point data at variable scales of resolution. Site-level or aggregated data points are gridded and contoured according to corresponding numeric values. Used to identify hotspots of concern when zoomed out to regional and/or national scales of resolution
Example Indicator: Concentration of earthquake risk for a given region of interest.
User Interaction: User can retrieve interpolated values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts
Code Samples:
• https://observablehq.com/@efrymire/gridding-map-files



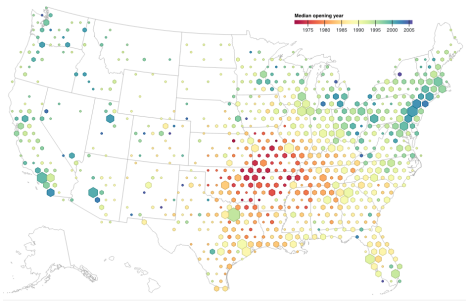
Choropleth Map

Purpose: Display spatial variation of RiskProfile Indicators for a given region based on divided geographical areas (Census geometries) that are colored in relation to a numeric values. Proportional numeric values are used to avoid visual weighting bias associated with larger geographic regions. Attribute values are dynamically themed using either quantile or threshold exceedance values.
Example Indicator: Proportion of the population likely to be displaced for more than 30 days
User Interaction: User can retrieve aggregate attribute values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts
Code Samples:
• https://observablehq.com/@d3/quantile-choropleth
• https://observablehq.com/@d3/threshold-choropleth



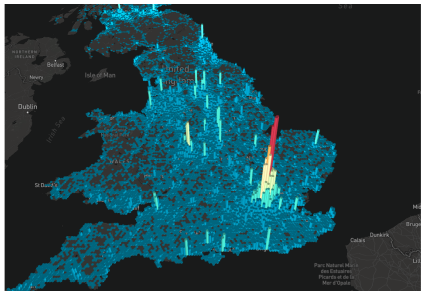
Bivariate Choropleth Map

Purpose: Visualize the relationship between two spatially distributed attribute variables on a single map layer by combining two different sets of normalized thematic data. Used to help draw out cause-effect relationships that would otherwise only be visible by visualizing comparing two separate maps side-by-side.
Example Indicator: Populations most vulnerable to the physical impacts of a disaster event.
User Interaction: User can retrieve aggregate attribute values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts
Code Samples:
• https://observablehq.com/@d3/bivariate-choropleth



Hexbin Map

Purpose: Display aggregated point data at regional and national zoom scales to draw out fundamental thematic patterns. Hexbin size changes dynamically as the zoom scale increases. This technique is particularly relevant for use in Canada where settled areas are concentrated in relatively small regions of the country. Used for zoom scales greater than 1:500,000
Example Indicator: Number of buildings that exceed the 1%/50 year collapse threshold
User Interaction: User can retrieve aggregate attribute values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts
Code Samples:
• https://observablehq.com/@nbremer/hexagon-grid-heatmap
• https://observablehq.com/@d3/hexbin-map



3d Hexbin Map

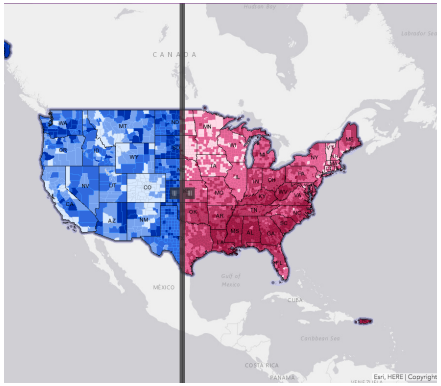
Purpose: Display aggregated point data in 3 dimensions at regional and national zoom scales to draw out fundamental thematic patterns. Hexbin size changes dynamically as the zoom scale increases. This technique is particularly relevant for use in Canada where settled areas are concentrated in relatively small regions of the country. Used for zoom scales greater than 1:500,000

Example Indicator: Number of buildings that exceed the 1%/50 year collapse threshold

User Interaction: User can retrieve aggregate attribute values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts

Code Samples:

- https://observablehq.com/@kforeman/untitled



Swipe Map

Purpose: Compare map patterns between two different temporal or condition states of a variable. This technique would be particularly effective in visualizing the potential to reduce risk through proactive investments in mitigation and/or adaptation.

Example Indicator: Losses avoided by retrofitting seismically vulnerable buildings

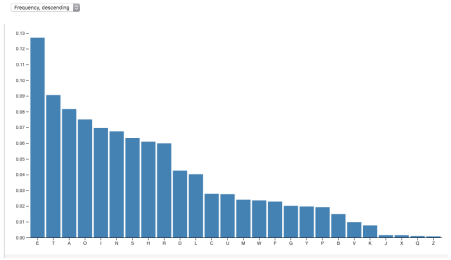
User Interaction: User can retrieve aggregate attribute values for a given location by clicking on map features and can filter data based on tag values in legend and/or corresponding charts

Code Samples:

- https://github.com/Esri/storymap-swipe/blob/master/README.md
- https://developers.arcgis.com/javascript/3/jssamples/widget_swipe.html

Visualizing Statistical Patterns of Risk

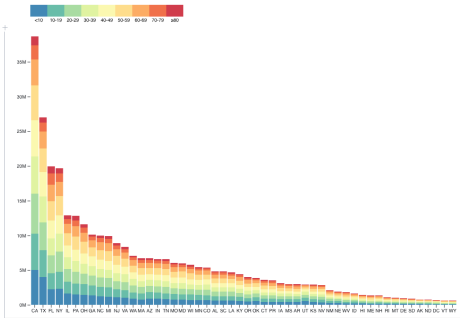
Simple Bar Chart



Purpose: Compare single attribute values across a set of categorical variables. The heights or lengths of the bars for each category are proportional to the values they represent.
Example Indicator: Number of injuries in selected Census Subdivision regions
User Interaction: Tooltips return attribute values for a given category. Clicking on the bar for a given category highlights or filters the corresponding spatial objects on the map.
Code Samples:

- https://observablehq.com/@d3/sortable-bar-chart
- https://observablehq.com/@tgotwig/simple-random-barplot-with-tooltips
- http://bl.ocks.org/Caged/6476579

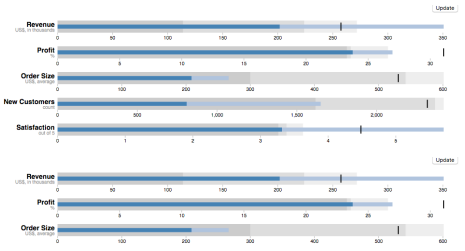
Stacked Bar Chart



Purpose: Compare attribute values for multiple groups of data across a set of categorical variables. The heights or lengths of the bars show the combined results of the groups for each category. Used to help draw out statistical patterns when datasets are disaggregated by thematic tag values.
Example Indicator: Number of injuries grouped by level of severity in selected Census Subdivision regions
User Interaction: Tooltips return attribute values of a selected group for a given category. Clicking on the bar for a given group in a category highlights or filters the corresponding spatial objects on the map.
Code Samples:

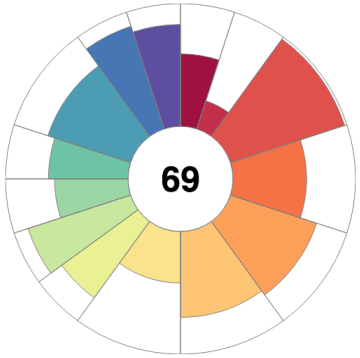
- https://observablehq.com/@d3/stacked-bar-chart#

Bullet Chart



Purpose: Similar to a bar chart, but with additional information to compare a given quantitative measure (damage, loss, etc) with a range of categorical values (low, moderate, considerable, etc) or variable states (baseline, scenario 1, scenario 2, etc).
Example: Expected impacts and consequences of a damaging earthquake with and without retrofit measures in place
User Interaction: Tooltips return attribute values for a given category.
Code Sample: https://bl.ocks.org/mbostock/4061961

D3 Aster Chart



Purpose: Compare single attribute values across a set of categorical variables. Aster plots display pie slices as lengths extending outward to the edge (0 at inner to 100 at outer). Widths of the pie slices represent the weight of each pie, which gets used to arrive at a weighted mean of the length scores in the center

Example Indicator: Severity of multi-hazard threat for a given region, where each bar of the chart represents the relative intensity for any specific hazard type (earthquake, flood, wildfire, etc)

User Interaction: Tooltips return attribute values for a given category

Code Samples:

- http://bl.ocks.org/bbest/2de0e25d4840c68f2db1
- https://observablehq.com/@git-ashish/d3-aster-chart

Sequence Starburst Chart

Purpose: Visualize and explore attribute values for a hierarchical structure of data (Risk Profile). Each level of the organizational structure (taxonomy) is represented by a categorical ring that comprises a disaggregated subset of data.

Example: Composite risk profile for a selected feature or for an aggregate group of features

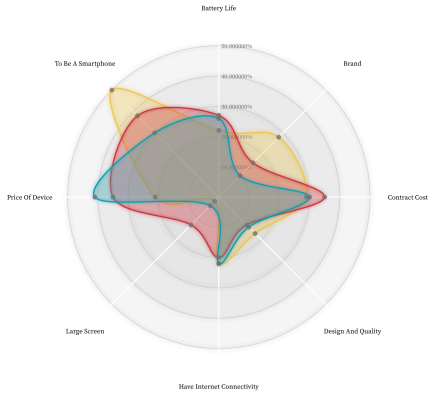
User Interaction: Hovering over any component of the taxonomy displays the hierarchical structure of the data and returns the corresponding attribute values of interest.

Code Samples:

•https://observablehq.com/@kerryrodden/sequences-sunburst

•https://observablehq.com/@d3/zoomable-sunburst

Radar Plot



Purpose: compare a series of quantitative measure (damage, loss, etc) for a range of categories (baseline, scenario 1, scenario 2, etc).

Example: Expected impacts and consequences of a damaging earthquake with and without retrofit measures in place

User Interaction: Tooltips return attribute values for a given series and category.

Code Sample:

•https://observablehq.com/@rayraegah/radar-chart