Developing a Resiliency Index for CSU Campuses

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Sustainability and resilience have become intrinsic to good planning and are particularly important to Cal Poly's Master Plan. Professor William Siembieda discusses his interdisciplinary elective Hazard Mitigation Planning and Design, *and describes the students' efforts in developing an index to measure campus resiliency.*

Over the past decade, many college campuses have tried to become more sustainable and lower their carbon footprint. In the last five years campuses have also asked, how do we become more resilient? The national think tank Second Nature along with carbon and climate adaptation commitment, has added a new focus on resilience with links between campus and community.[1] Just how does a university determine it's resiliency?[2] What type of metrics are needed to do this? What actions can you take, once an index is created? How are these metrics need to be linked to the system under consideration? These are valid questions that usually take a long time to answer, and require a lot of resources to create metrics, to understand them, and to actively manage them.

This essay describes how students in the interdisciplinary elective *Hazard Mitigation Planning and Design: Towards Resilient Communities* constructed indexes to measure resiliency at CSU campuses. Offered by the City and Regional Planning Department, the class also included students from Landscape Architecture, Construction Management, and Natural Resource Management.

In constructing an index, one needs to start with defining the metrics. ARUP, the global architecture and engineering firm, has a City Resilience Index (CRI) for use in establishing resiliency in medium and large cities around the world. The CRI uses 172 indicators, grouped in four domains. The ARUP index provided a basis for this campus index. A partnership with ARUP's San Francisco office was formed with the College of Architecture and Environmental Design's National Resiliency Initiative Program to establish a campus index tool. The ARUP city approach requires large data sets, and metrics suited for city analysis, but not campus scale analysis. The city approach was modified to focus on a campus and its surrounding community. This modification process became the Campus Resiliency Index (CaRI). ARUP professional staff worked to redesign the index and assisted the student's who were collecting the index data.

The CaRI identifies a university's naturally occurring and human-made stressors, and gages the strengths of preparatory actions to address the disturbances and possible shocks. The impact of these disturbances and stressors are examined using four main (domains) categories representing the campus system. These are health and well being, infrastructure and environment; governance and leadership; and education and business. The CaRI narrowed the indicators to those relevant to campus life such as health services, facilities, research, etc. A major difference between the CRI and the CaRI is the inclusion of community factors. The CaRI recognizes that the campus has a relationship with its surrounding community that does influence the way a campus provides for its students, faculty and staff.

To obtain information about the 53 indicators chosen for the campus index, a trial of seven campuses was conducted by teams of three students per campus. The campuses ranging in size from 7,000-40,000 students, located in urban and rural settings, were within the California State University campus system. Using an initial list of campus contacts, the student team spoke on the phone to campus staff people, such as sustainability coordinators, and IT managers; read campus documents, looked up information on the web, developed campus profiles, established a qualitative score for each of the variables, summed the scores, and provided an index for the four main categories. They then developed their own "CaRI Wheel" to illustrate the index. This wheel replicates the ARUP wheel for cities. The students scored each variable on a 1-5 scale. Most scores clustered near the middle of the range, with some lower scores, reported.

While keeping to the ARUP four-domain model, the students were able to customize their Resiliency Wheels to express how they wished to display the information. The student team report included

[1] See: (http://secondnature.org/climate-guidance/sustainability-planning-and-climate-action-guide/building-blocks-for-sustainability-planning-and-climate-action/climate-resilience/#A_Resilience_Planning_and_Implementation_Framework)

[2] Resiliency, as defined in this instance, means the capacity of a system to absorb disturbance and reorganize to retain essentially the same function, structure, and feedbacks, to have the same identity.

spreadsheet score sheets, a narrative on conversations about the campus interviews, and sources of information consulted. Instead of taking 18-24 months to complete, as is the CRI practice, the student teams did their work in four weeks. The seven campus trial was a "proof of concept" effort. It demonstrated the validity of some metrics, a method for information collection, and a sense of where each campus stood regarding its resiliency. The students gained a deeper understanding of what resiliency is, differences between campuses and the need for establishing a "spatial" context. Their work provides a benchmark for the campuses to move from resiliency thinking to resiliency practice.

The student teams were allowed to create their own wheel figures using the ARUP CRI as a model. The CaRI wheel shown in Figure 1 places the four domains on the outside rim and shows the scores in the grey rings. The CaRI in Figure 2 places the four domains on the inside ring and shows the scores radiating to the outer edges. The Type 3 wheel has the domains outside of the center and brackets the domain three goals, and visually emphasizes the goals. Lower scores appear in the inner rings, while higher scores appear in the outer rings. For this campus, the Infrastructure and Built Environment domain scores received the best scores. Note that these are student scores derived for educational purposes only.

The next step in this projects is to work directly with campus staff to choose the more important metrics for them and to determine the dominant threats; and how to construct thresholds levels (for education, research and safety) that need to be consistently monitored and attended to.

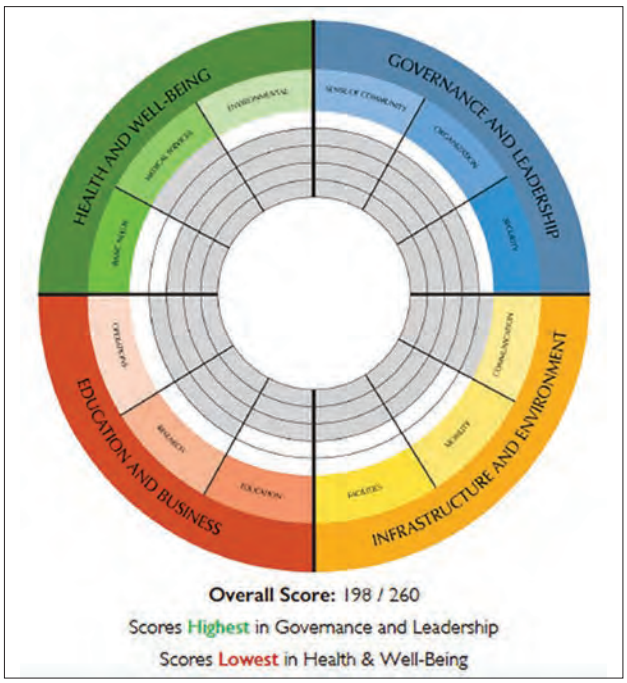

Figure 1: Student developed CaRI wheel Type 1.

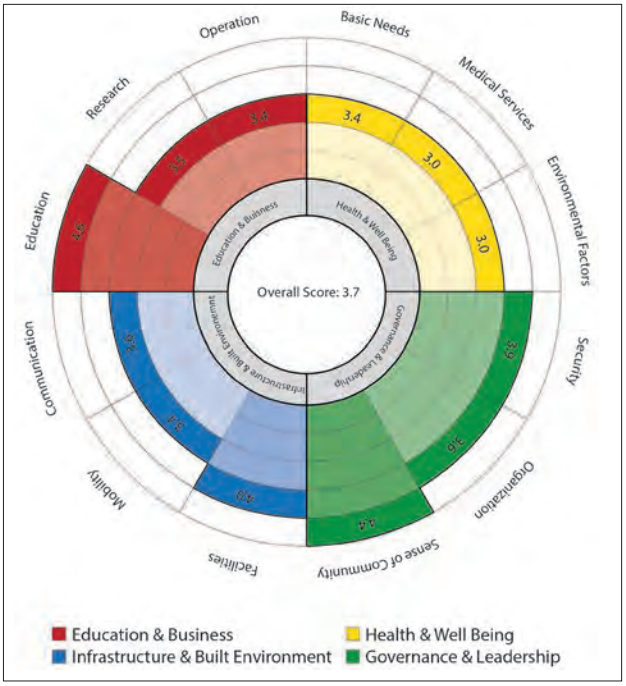

Figure 2: Student CaRI wheel Type 2.

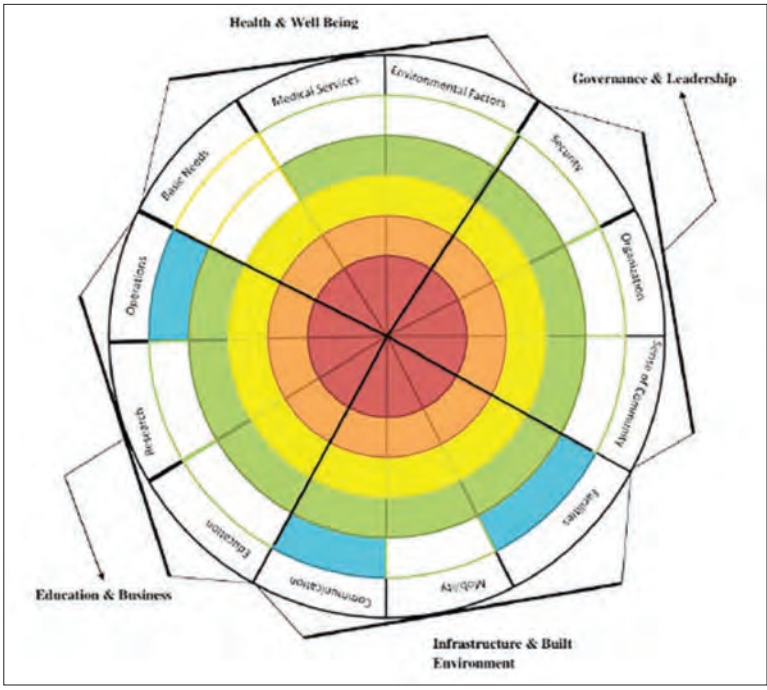

Figure 3: Student CaRI wheel Type 3.