Implementing A Regional Sustainability Plan With Scenario Based Planning

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Abstract

A great many regions and communities in the US and Europe have invested heavily in the development of regional plans to promote more sustainable community development. The transition from plans to plan implementation is often difficult as buy-in among regional stakeholders is not always uniform nor always positive. In recognition of such problems, the US Department of Housing and Urban Development initiated a Sustainable Communities Grant program which allowed regions of the US to compete for funds to undertake collaborative plan implementation processes.

The Central Texas region was a recent recipient of one of those US HUD Sustainable Communities Grants engaging a broad spectrum of regional stakeholders in the development of scenario planning software to explore the creation of sustainable activity centers in the next 30 years in urban, suburban and rural settings. This paper describes efforts to create a second generation scenario based planning software system that better enables communities to make informed choices about the creation of more sustainable land use patterns. The great promise of scenario based planning is that it provides an immediate feedback loop to participants on "what if" land use scenarios so that inappropriate or incompatible development can be avoid or minimized. The new software program also strives to be educational in that it provides design solutions and choices when adverse effects arise in its indicator report system. The paper describes the current regional collaboration and network of partners that are developing the software suite. It details the sustainability indictors being developed for the analytic software suite. The paper concludes with a discussion of long term objectives for the software on an open source platform with internet browser accessibility.

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Background

In June 2009, the Secretary of the US Department of Housing Urban Development, Shaun Donovan, announced the Sustainable Communities Planning initiative coordinated within the Federal government's Interagency Partnership for Sustainable Communities. The Obama Administration is seeking to transform the way federal grants and programs facilitate sustainable development practices in US metropolitan regions by creating better interagency coordination and cooperation, and providing planning and implementation grants to regions that propose to collaborate and define a shared vision of sustainability through regional planning. That initiative led to the creation of a new *Office of Sustainable Housing and Communities* within HUD to coordinate the initial $100 million grant program. Three federal agencies--the US Department of Transportation, the US Environmental Protection Agency and US HUD--have committed to focusing their grant and infrastructure investment efforts to help advance six overarching Livability Principles to help American families gain better access to affordable housing, more transportation options and lower transportation costs, while protecting the environment and reducing energy dependence on fossil fuels. In 2011, HUD expanded the initial planning grant program to include a second category of grant recipients--*Detailed Execution Plans and Programs* for those regions that already had completed and adopted a regional sustainability plan.[1] An additional $67 million in grant funds became available for the second year of the program. Seventy four regions were recipients of the Sustainable Community grants (see figure

1 below), however the Interagency Partnership for Sustainable Communities boasts $3.5 billion in directed support to metropolitan regions in the US.[2]

Figure 1: Sustainable Communities Regional Planning Grantees (2012)

The overall objectives of the 2011 round of grants are to: (1) support metropolitan areas and multijurisdictional partnerships to adopt integrated plans, strategies, and management tools; (2) create strong alliances of residents and regional interest groups able to maintain a long-term regional vision and simultaneously support incremental sustainable development practices; (3) build greater transparency into planning efforts and assess progress toward national goals by identifying best practices and performance; (4) expedite implementation of the Livability Principles through changes in local zoning and land use that remove barriers to sustainable development; (5) assist regions that have shown a long-term commitment to sustainability to prepare for implementation and demonstrate on-the-ground results; and (6) identify how Federal agencies can better support local and regional planning and reduce redundant and conflicting Federal requirements.

A consortium of Central Texas governments, NGOs and interest groups received one of the 2011 Sustainable Communities Partnership implementation grants. The Consortium proposed to build off the region's successful regional planning venture and develop a next generation scenario based planning software suit to help the region's 20+ cities and five counties to implement their preferred regional vision adopted through the Envision Central Texas process. This paper describes the Central Texas regional collaboration and network of partners that formed and are developing the software suite which will be completed by the end of 2013. The software suite will be public domain and freely available to regions through the US and world. The paper describes the sustainability indictors being developed for the analytic software suite as well as additional software capabilities. The paper concludes with a discussion of long term objectives for the software on an open source platform with internet browser accessibility.

The Capital Area Texas Sustainability (CATS) Consortium and Partners

The Capital Area Texas Sustainability (CATS) Consortium is a broad-based collaboration of public, private, academic and nonprofit stakeholders in the Central Texas region (Austin-Round Rock MSA) that seeks to build on the region's previous sustainability efforts and to implement the region's plan and vision for sustainable development. At the start of the project the core members and partners of the consortium included:

- Capital Area Council of Governments (Lead agency)
- Capital Area Metropolitan Planning Organization (CAMPO) (the regional transportation authority)
- Envision Central Texas (ECT) (a 501(3)(c) nonprofit organization for regional planning and implementation)
- City of Austin, including its planning, housing, transportation and economic development departments
- City of Round Rock
- City of San Marcos

- University of Texas at Austin, The Center for Sustainable Development (lead), The Texas Advanced Computing Center, and the Center for Transportation Research, the University of Utah, Metropolitan Institute
- IBM, through its Smarter Cities program (IBM later dropped from the team due to licensing concerns)
- Fregonese and Associates, HDR Associates and Criterion Planners (replacement firms for the IBM role)

The foundation of the CATS Consortium sustainability implementation effort is the regional vision and preferred growth scenario developed between 2002-2004 by Envision Central Texas (ECT), a broad-based regional nonprofit with extensive community participation by more than 12,000 Central Texans (see figure 2 below).[3] The physical plan reflects efforts to concentrate substantially more growth in largely existing community centers and to move regional transportation infrastructure investments toward more multimodal choices include transit, biking and pedestrian systems.

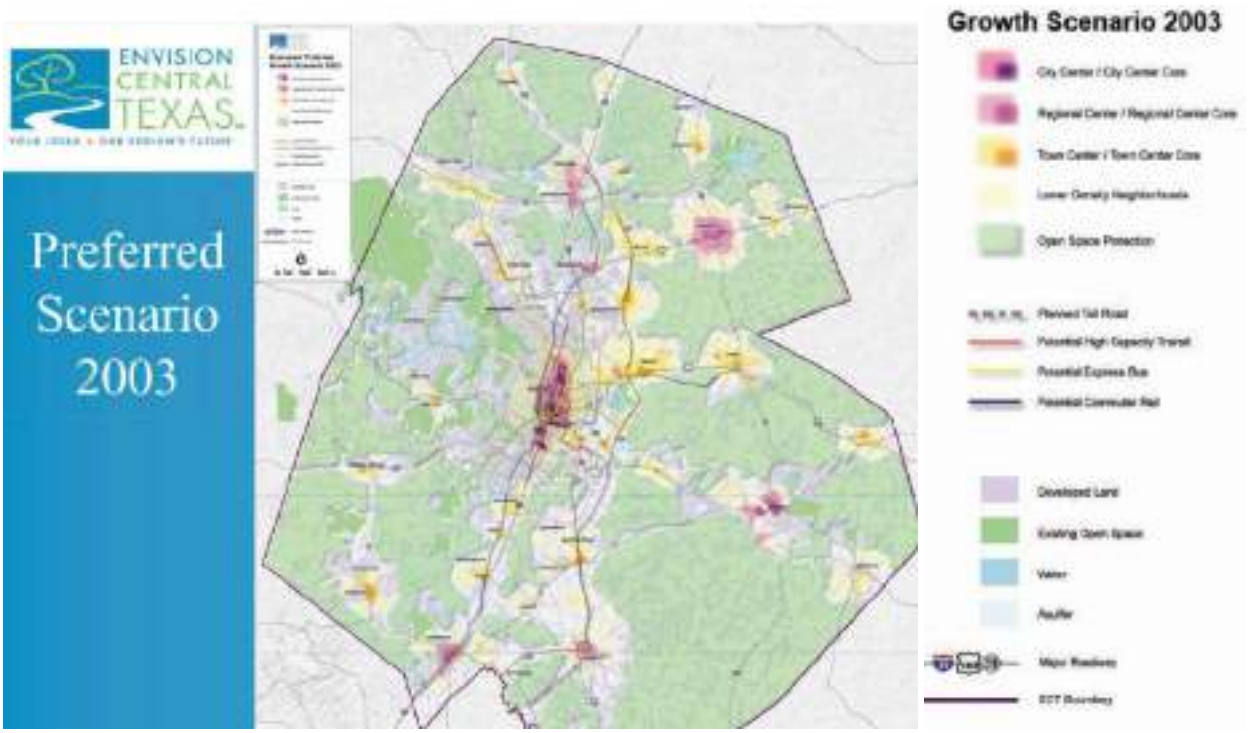

Figure 2: The Envision Central Texas Preferred Growth Scenario (2005)

Source: Accessed at:
http://envisioncentraltexas.org/resources/resources_74_Preferred_Scenario_2003_illustration.pdf

The core elements of the regional vision include:

> ***An effective transportation system that improves mobility throughout the region, increases transportation choices, including roads, rail, trails and bikeways, and is coordinated with land use planning.***
>
> ***Protection of our environment and natural resources so we will have the open space, parks and trails that people cherish, preserve our ecologically sensitive land and ensure sustainable clean water and air for future generations.***
>
> ***A diverse and thriving economy with a robust base of businesses and quality job opportunities for citizens and a distribution of jobs throughout the region.***
>
> ***A variety of housing choices, affordable for everyone in the region and offering a mix of styles, such as neighborhoods with pedestrian-friendly streets or housing that is within walking distance to transit and stores.***
>
> ***Preservation of our region's unique character by protecting and enhancing or neighborhoods, towns, rural areas, historic sites, and special sense of place.***
>
> ***An understanding that social equity and racial harmony are core values that strengthen us and actions that foster respect, civility, and opportunities for all.***
>
> ***A region -wide understanding that our fortunes are tied together requiring planning, participation and collaboration by stakeholders throughout our region to ensure a successful and livable future for Central***

In 2008, ECT undertook a progress assessment on regional efforts to implement the adopted plan and vision, and concluded that while there remained strong support for the regional vision and the need for coordinated land use and infrastructure planning, a major barrier to implementation was that many localities lacked the resources to plan and implement plans in their own jurisdictions.[4] Many localities lacked the staffing and technical support to craft activity center plans, CIP programming and land development code modifications to implement the preferred scenario in their own jurisdictions. However, despite these limitations in terms of local efforts to

advance the vision, two important accomplishments were completed in the years immediately following the ECT plan that added both credibility and stronger coordination of regional planning efforts: those were the ***Central Texas Greenprint*** and the ***CAMPO 2035 Long Range Transportation Plan***. [5]

Between 2006 and 2009, the Trust for Public Lands, CAPCOG, The University of Texas, and City and County governments in the Central Texas region undertook a Greenprinting process (i.e., open space and preservation lands suitability mapping) taking into account lands necessary to protect water quality (especially riparian zones) and quantity (i.e., karst recharge areas); ecologically sensitive areas such as endangered species habitat; prime farmlands and ranches; important recreational resource lands; cultural and historic sites, and scenic corridors to assist localities in defining priority lands for protection from land development. The project created an interactive GIS map system that enables state and local governments to query land development and infrastructure development proposals against the regional open space maps to prioritize protection programs and measures; to avoid water, sewer and transport infrastructure decisions that would conflict with the green infrastructure plan, and to enable acquisition of the highest priority lands as development in the region proceeds. [6]

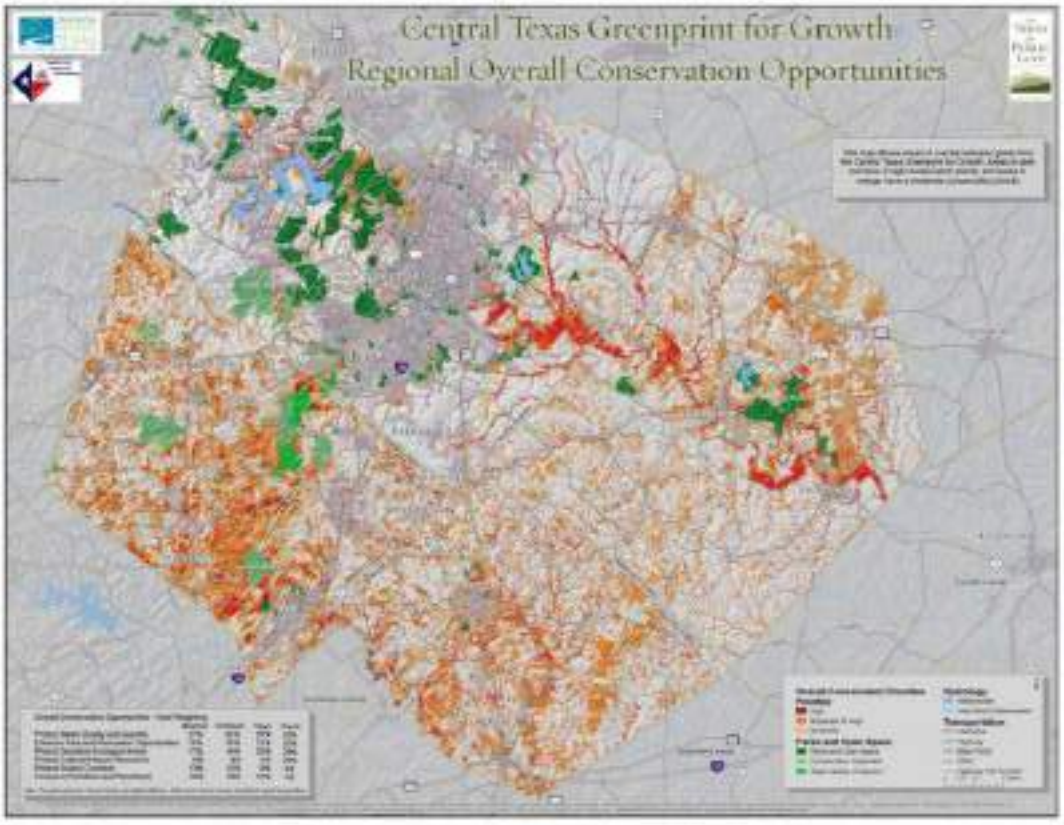

Figure 3: The Central Texas Greenprint

The ECT vision and preferred growth scenario and Greenprint in turn informed the creation of CAMPO's 2035 Long-Range Transportation Plan, which envisions future regional growth being accommodated in a network of 37 mixed-use, mixed-income, walkable, connected and transit-supportive Activity Centers that provide a balanced mix of jobs, housing and services, primarily within the context of existing communities (see figure 4). The Activity Centers concept is designed to improve the region’s livability outcomes in such areas as transportation system performance, air and water quality, and social equity and opportunities for revitalization.

Under the Centers Concept, funding is targeted to expand the region’s public transit system (including buses and rail), to implement a network of high capacity roadway lanes, and to build new arterials serving the mixed use centers. CAMPO intends to create a specialized program that

sets aside 50 percent of future Surface Transportation Program Metropolitan Mobility funding for projects that support the activity centers shown on the Centers Concept map. Those funds would be available to a wide range of projects to enhance transportation and livability in Activity Centers, including bicycle and pedestrian improvements, travel demand management projects, transit projects, and planning studies. Project selection is expected to be based on the extent to which the transportation project would leverage local planning and investment resources to create a successful mixed use activity center over time.

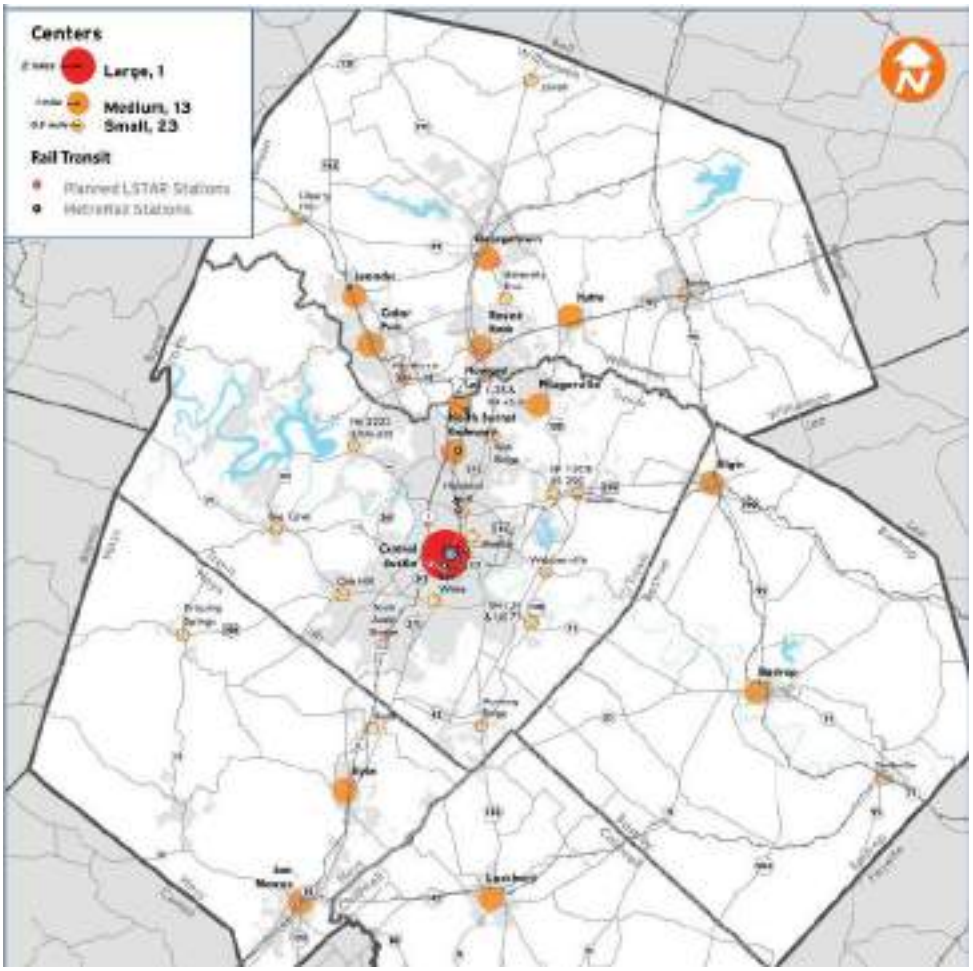

Figure 4: The CAMPO 2035 Long Range Transportation Plan Growth Concept Map (2010)

The HUD Regional Sustainability Planning Grant has enabled the CATS Consortium to focus on innovative and practical strategies that will help bring the Activity Centers concept to fruition within the context of Central Texas, where the power to make the key planning and investment decisions necessary to implement the concept belongs almost exclusively to local communities. The strategies include:

1. Development of a **Sustainable Places Analytic Tool** in partnership with the University of Texas partners and contractors that allows for scenario based planning at multiple levels with sustainability metrics that are responsive to local values and concerns within the host localities and their Activity centers.

2. **Demonstration Projects** (applying, testing and refining the analytic tool) at selected Activity Center sites to implement best practices for and overcome obstacles to compact, mixed-use, mixed-income development with balanced jobs and housing linked to the local and regional multimodal transportation network.

3. Broad-based **community engagement** (along with focused engagement around Activity Center demonstration sites) to build awareness and consensus around the Livability Principles and sustainability strategies.

4. Development of, and ratification of a **regional Compact** between cities and other jurisdictions committing to the adoption of common planning elements and supporting the coordination and integration of local comprehensive plans.

The remainder of the paper focuses on the analytic scenario software system that will be beta tested at the demonstration site communities.

The Sustainable Places Project Analytic Tool Suite

One of the more important developments in US physical planning over the last 15 years has been the increased use of scenario-based planning approaches at regional and local levels where land use and transportation decision making and their interrelated impacts on community

sustainability issues can be iteratively explored with indicators that provide the all important feedback loop on decision making. According to Bartholomew and Ewing (2010) the birthplace of this emergent area of planning practice can be traced back to two projects in the late 1980s and 1990s that looked at land use planning and transportation investment choices in a systemic manner: Montgomery County's Comprehensive Growth policy Study and the 1000 Friends of Oregon's LUTRAQ project. Both projects led to better consideration of the impacts of alternative land use and transportation development scenarios.[7] Since that time Bartholomew and Ewing (2010) have documented 74 regional scenario planning projects in the US. Often times these scenario planning efforts fall under the rubric of Blueprinting or Regional Visioning projects.

Some of the more notable success stories that have used scenario planning to inform public opinion and garner support for more sustainable land use and transportation investments include: the Portland Metro 2040 Vision; the Sacramento Blueprint, Envision Utah, and the Wasatch Choices 2040 plan.[8] The Envision Central Texas vision and preferred growth plan also built on that tradition, working with the planning consulting firm Fregonese and Associates using ARC GIS based scenario planning tools in development of the regional plan. The scenario planning process and software enabled the region's citizens and public to more realistically evaluate future land use patterns and their potential impacts on the region’s transportation system, land fragmentation, housing supply, farm and working lands, jobs-housing proximity and balance, as well as environment and natural resources impacts (among other measures).

As a result of the persuasive effect that scenario planning had on the Central Texas regional planning efforts, the CATS Consortium believed that one of the most important ways to help Central Texas localities realize plans to design and create more livable activity centers would be through the creation of the next generation scenario planning software. As defined by the

Consortium, the next generation of scenario planning software would need to meet several pressing needs, including: (1) minimizing the GIS data collection import and cleaning operations that would be needed to use the software, (2) allow for creation of land use scenarios that are based on market realities and not just land use class distinctions, and that can operate at a district or neighborhood scale, (3) enable scenarios that offer a host of metric and indicators that can be matched to local interests and value as opposed to what a technical planner might say is most important, (4) scenario software that serves more of a learning and solutions function than the current generation of software offers, (5) software that serves both the planner/ consultant works but also that some accessibility for officials and the public, and (6) software that links alternate development scenarios to visualization and on-line preference ranking to expand public dialogue away from the charrette or planning workshop.

To that end, the Consortium and its partners assembled a team of planning academics and consulting firms to accomplish those tasks to create the next generation of scenario planning software. The remainder of this section highlights each of the core components of the software project development and partner contributions.

A. The Sustainable Place Project Data Schema and Wizard

During focus groups with the Central Texas region's local planning directors, we learned that one of the more significant barriers to the use of scenario planning software at the local level are the substantial transaction costs associated with getting ARC GIS data layers needed to do the analysis, ready for use and imported in a compatible format with the software. Although a great deal of land use, economic, social , demographic, environmental, and infrastructure data is readily available in ARC GIS compatible formats, a number of issues can arise and require data

cleaning and other forms of manipulation (e.g., differing coordinate and projection systems) to be compatible enough with the ARC GIS software to be accurate and usable for scenario planning purposes. The CATS Consortium has contracted with Criterion Planners Inc., who are the creators of scenario planning software package known as INDEX, to create a standardized data schema and data quality wizard to (1) reduce time loss due to uncertainty about GIS data formats and fields, and (2) to provide automated routines to correct common data cleaning problems such as removing bad geometries (e.g., null, self-intersecting, irregular polygon slices, etc), street-centerlines-to-parcel-rights-of-way alignment checks, multi-part demographic parcels split issues, proper boundary-to-land-use topology and technical design coordination to ensure the software can be ported to an open source platform as those GIS options become more viable in the coming years. Data schema and wizard is designed to reduce uncertainty, increase transparency and ease of use for the new software system.

B. The Sustainable Places Project: Envision Tomorrow Plus Software

The CATS Consortium considered a variety of alternative software products that we could work with that were already considering going open source so they could meet the terms of the HUD grant. After meeting and discussing the project with multiple software vendors the CATS team selected the Envision Tomorrow (ET) software package created by Fregonese and Associates because it came the closet to meeting many of the CATS consortium objectives. First, as a result of an existing collaboration with the University of Utah Metropolitan Institute, the ET software was already undergoing changes in terms of modeling land use scenarios from a building typology instead of a land use or place based typology. By basing land use planning scenarios on a building library, it becomes possible to create development pro formas for each building type to ensure that market feasibility is built into the model from the beginning. Typically a

library of 30-40 buildings with a pro forma for each building type is created as back ground work to scenario development with a series of focus groups with area developers. Once that step is completed land use classes or place types can be constructed from a cross section of building types, reflecting variations in land use densities and intensities for urban, suburban and rural market conditions. This called the *Return on Investment Analysis System* which is an interconnected group of excel spreadsheets that are linked to the ARC GIS attribute tables.

A second major advantage of the ET software was the interplay between excel building information and sustainability indicator formulas. Thus, once a design workshop begins and alternative land use and transportation alternatives are being painted in ARC GIS, the results are being dynamically relayed to the spreadsheets enabling on the fly calculations if sustainable community metrics that can be viewed in parallel format with the scenario development. This enables real time learning of the consequences of multiple land use choices through an interactive display. The University of Texas at Austin, the University of Utah and other partners are creating a new suite of sustainability analytic tools and indicators that can be selected by localities to explore the consequences of alternative development schemes depending on communities values and interests. It expected that somewhere on the order of 40-45 sustainability indicators can be toggled on or off by the user. A major enhancement over existing software packages is the addition of pop-up windows for each sustainability indicator that explains the theory behind each indicator, the connections between the indicator and livability concerns, and links to design solutions via hypertext links to online sources and a bibliography.

Additionally, several special analytic capabilities are also being created that required considerable local or regional calibration to be useful in other regions such as a fiscal impact

model that accounts for variation in land uses and development densities on infrastructure costs and local operating and capital budgets. A 7D transportation travel estimation application that provides instant feedback on a variety of transportation related indicators during the scenario creation process. The tool will estimate travel behavior (auto, transit, walk/bike) from land use scenarios.. A housing and transportation costs estimator will allow analysis of the interplay between the two elements, and estimate the combined housing and transportation costs from different scenarios. An air quality and green house gas estimator will be created based on changes in VMTs and mode shifting from alternative land development scenarios. A public health estimator will build off the 7D estimator building on a meta-analysis to predict public health implications from the travel behaviors and recreational opportunities that derive from alternative land use scenarios. Rates of obesity and associated health outcomes (coronary heart disease and Type 2 diabetes) may also be estimated based on research findings. Other estimators are under development with the idea being that the software will ultimately function like an apple iphone where with open source code access additional analytics can be add like "apps" on an iphone.

C. The Sustainable Places Project Browser and Participatory Engagement Template System

Once a community has completed a design workshop process and created 2-4 alternate development scenarios for its downtown or other focal area, the question is how does a community get by-in from its public to that envisioned future, and engage the public in a dialogue on those planning results in a meaningful way. To address this issue, the CATS consortium contracted with the Texas Advanced Computing Center to create an on-line public engagement software system where products from charrettes can be easily ported to a web template for on-line public participation. A second objective is to take the ET software in a more

limited fashion into a web based browser environment so citizens can explore "what if" scenarios themselves for their city. It is hoped that eventually the project will be able to engage with ESRI city engine modeling system to enable high quality 3D visualization as well. However, this is a long term hope that is not included in the project's current grant scope.

D. The Sustainable Places Project Into The Future

Perhaps the most important part of this project from the CATS Consortium perspective is the shared interest in growing the software system well beyond the end of the HUD grant period in 2013. It is hoped that the system will continue to evolve and grow eventually into the open source GIS environment. There is strong interest among the Consortium members to seek out additional grant funds to refine and improve this evolving software system.

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[1] US HUD, 2010, HUD Will Award $67 Million for Sustainable Communities PlanningAccessed at: http://www.p4sc.org/articles/all/hud-will-award-67-million-sustainable-communities-planning

[2] US HUD, 2012, accessed at: http://www.sustainablecommunities.gov/pdf/psc-2012-priorities-and-demand-chart-march%202012.pdf

[3] Accessed at: http://envisioncentraltexas.org/resources/ECT_visiondoc.pdf

[44] Accessed at: http://envisioncentraltexas.org/resources/TIP%20VPA%20External%202008-07-21%20FINALwcover.pdf

[5] The Central Texas Greenprint can be accessed at: http://envisioncentraltexas.org/resources/CenTexReport.pdf and the CAMPO RTP for 2035 can be accessed at:

[6] See summary at: http://contextsensitivesolutions.org/content/case_studies/central_texas_greenprint_for_gr/

[7] Bartholomew, Keith and Reid Ewing, 2010, Integrated Transportation Scenario Planning, FHWA-HEP-10-034, Washington DC: USDOT.

[8] For further information on these plans and projects see --Envision Utah: http://envisionutah.org/historyenvisonutahv5p1.pdf; Sacramento Blueprint: http://www.sacregionblueprint.org/sacregionblueprint/the_project/Blueprintspecialreport.pdf; Portland Metro 2040: http://www.oregonmetro.gov/index.cfm/go/by.web/id=29882; the Wasatch Choices 2040: http://www.wasatchchoice2040.com/

For additional examples see: Montgomery, Carleton (2011) Regional Planning for a Sustainable America, New Brunswick, NJ: Rutgers University Press.