Scenario Planning
Course Development Guide

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For more information on this group, see: http://scenarioplanningtools.org/

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Contents

1. Guide Overview

The guide was prepared on behalf of the Curriculum Subcommittee of the Open Planning Tools Group (OPTG) to serve as a resource for instructors at higher education institutions interested in teaching courses which utilize emerging open planning tools. The focus of the guide is on scenario planning tools in particular, although much of the general guidance provided may apply to other types of planning tools. The guide draws on insights from the authors, the instructors of the profiled courses, and OPTG members who provided their input.

We believe that while teaching graduate-level courses which involve cutting-edge technologies poses new challenges, it is possible to offer these courses within existing academic programs and with modest additional resources. Developing and teaching such courses can help improve the quality of professional urban planning practice, by producing a new generation of planners with theoretical knowledge of scenario planning and the technical skills to implement these ideas. While there are many successful models of teaching with technology, this guide draws on some of the lessons learned from three courses which have been offered recently: a course on sustainable land use planning offered by Robert Paterson and Tom Hilde at the University of Texas at Austin, a course on scenario planning offered by Robert Goodspeed at the University of Michigan, and a course on scenario planning using Envision Tomorrow offered by Dejan Eskic and Keuntae Kim at the University of Utah. Profiles of these three courses, including their overall structures, objectives, and schedules, are included at the end of this guide. These profiles also include contact information for the instructors.

The guide is organized into the following sections: **Course Design Considerations** discusses decisions about how to balance course learning objectives and fit courses within existing curricula. **Resources** discusses some of the additional resources and preparation this type of course requires. **Course Evaluation and Lessons Learned** discusses some of the early lessons learned from the work by OPTG members. **Scenario Planning Tools** provides an overview of tools which might be integrated into new courses. Finally, the **Course Profiles** contains details about the three courses described above.

This guide is part of a broader effort by OPTG members to advance the theory and practice of planning which takes advantage of the latest information technologies. In addition to this guide, the OPTG Curriculum Subcommittee has compiled a syllabi library, developed laboratory exercises, and compiled a citation library. The group's other activities include monthly conference calls, an annual symposium, coordinating sessions at professional conferences, and hosting an awards program. For more information about OPTG or to become involved, visit the group website at http://www.openplanningtoolsgroup.org.

If you have corrections, suggestions, or other input regarding this guide, please send it to Robert Goodspeed at rgoodspe@umich.edu.

2. Course Design Considerations

Although OPTG members have diverse perspectives, a rough consensus has emerged for the best way to teach scenario planning tools and methods. In general, group members agree that these courses should contain a *balance* between theory and technical skills, and an emphasis on the interconnections between the two. The amount or type of theory or skills included in the course may vary, given the specific learning objectives. However, the group also observed that the state of technology in the field is very diverse and changing rapidly. This reason, together with the inherent limitations of semester-long courses, suggests the goal for effectives courses should be sufficient exposure to technologies but not necessarily an emphasis on highly technical work. Most technically sophisticated planning projects are implemented by groups of professionals, so new scenario planning classes should produce young professionals able to work in multiple capacities in multifunctional teams. Scenario planning is also itself a diverse field of professional practice, and includes a wide range of methodologies and tools. Instructors will have to make choices about the types of planning which are taught, however all courses should aim to reflect some of this diversity, and equip students to become innovative and reflective practitioners in a diverse field.

Instructors seeking to develop new courses should consider how the course will fit into the curriculum within their particular program. The three profiled courses reflect diverse approaches: at the University of Texas, scenario planning tools and concepts were added to an existing land use planning course; at the University of Utah, a workshop focusing on technical skills was offered over the summer to students and professional certificate students, and at the University of Michigan, a course was offered as an advanced elective seminar. All instructors should calibrate the content to take advantage of students' preexisting knowledge. Ideally, such courses should be coordinated with introductory coursework in planning theory and geographic information systems (GIS). Where these cannot be made prerequisites, or if these courses have specific weaknesses given the scenario planning class goals, instructors may need to cover background in these topics.

Each options for how courses in scenario planning theory and tools can be incorporated into a graduate planning curriculum has strengths and weaknesses. Courses can be offered earlier in the two-year curriculum, as part of a required or core class, or as an elective module. In this case, students will be able to use the methods and tools for other projects and coursework, such as in capstone or studio courses, typically taken in the last year. On the other hand, offering it later on in the curriculum has some advantages. In addition to planning theory and GIS, advanced scenario planning theory practice often relies on a wide range of specialized knowledge, such as how to conduct financial analysis, how to find and analyze diverse datasets, and familiarity with theories of urban form. If a course is offered later, students are equipped to learn about the methods in greater depth, serving as a methodological capstone to their planning education.

3. Required Resources

Offering a course covering scenario planning tools and methods requires a variety of additional resources than required for nontechnical courses. In addition, using new technologies introduces new pedagogical challenges. Although the specifics of both of these depend on the nature of the class offered, this section briefly discusses these issues in two sections: **Course Preparation** and **Practical Challenges.**

Course Preparation

To prepare for a scenario planning theory and tools course, the primary instructor will need to select the scale(s) which will be emphasized in examples and hands-on assignments. Some courses may select a project or demonstration site. The substance of the course could be designed to attract students with a variety of interests and concentrations, or focus on a specific topics or subfields of planning. These substantive choices will then influence the technical assignments, including what types of analyses or advanced technical labs are appropriate to include. If the course will have a teaching assistant or other staff, they should be involved well before the beginning of the semester. Staff responsibilities should begin at least a month in advance, in order to prepare the datasets for students to utilize when working with the scenario planning tools.

Adequate time should be allocated for obtaining and preparing data to be used in the class. Ideally, a dataset should be prepared that would include everything needed to run an analysis in the chose scenario planning tool. Instructors may choose to require students to obtain certain data for certain assignments, but this requires identifying the availability ahead of time. The course staff will need to identify and obtain a scenario planning tool (see section below). In turn, the planned tools and analysis will require obtaining certain data and configuration files. As an example, for ET+ this includes:

- Parcel-level shapefile with all necessary existing conditions data, i.e. scenario geodatabase,
- Modeled ‘trend’ scenario,
- Building prototype ROI models (Excel),
- Scenario builder model (Excel),
- Supplementary GIS data (roads, floodplains, water bodies, etc.).

A variety of parameters are required to build a scenario, and many of these variables could be easily obtained either from commonly used online free datasets or from local government agencies and other organizations. Table 1 (following page) provides guide for variables that are generically available for almost all places.

Category	Variable/Parameter	Note
Physical	FAR & Density regulations	Local zoning ordinance downloaded from Municode
	Parking Requirements	Local zoning ordinance downloaded from Municode
Financial	Building Construction cost	RS Means (may need proprietary access)
	Land/ Site Cost	Local property assessment offices or their online datasets
	Resident rents	Zillow, Trulia, Realtor, Co-Star, etc.
	Commercial rents	Loopnet (may need proprietary access to obtain more detailed information)
	Property tax	Local property assessment offices or website
Demographic & Housing	Household/ Population assumptions	American Community Survey B25010 average household size
	Existing median household income	ACS B19013 Median Household Income
	Existing population wages	Census Bureau MSA business patterns (http://censtats.census.gov/cgi-bin/msanaic/msasect.pl) or Bureau of Labor Statistics
	Existing housing costs	ACS B25105 Median Monthly Housing costs
	Affordability standards	B25106 Tenure by housing costs as a percentage of household income in the past 12 months
	Employment	EPA'S Smart Location Database or other equivalent, or Local agencies (such as Southeast Michigan Council of Governments)
GIS layers	Parcels, roads, water bodies	Local planning department or relevant website

Table 1. Overview of Needed Data for ET+

Please note that the above list is far from exhaustive. Many of the data required are very place-based (such as building energy consumption, block and street characteristics, etc.) and so local knowledge is often required. Given that the overall workload of a scenario planning theory and practice class is quite heavy, it is a good idea for the instructors to prepare most or all of the data for the students. Therefore, we suggest that the teaching assistant should work with the instructor to talk to local experts or to send out request to local government and other relevant organization to obtain the needed information.

Practical Challenges

Course instructors should be aware of potential practical challenges. Institutions vary in their computing resources and GIS availability. In addition, some scenario planning tools require IT support for installation and configuration. For course staff, implementing a scenario planning component, with necessary software tools, creates the possibility for unexpected challenges throughout the course of the semester. At the University of Michigan, for example, we encountered an installation issue: the ET+ ArcGIS Extension was not compatible with the Microsoft .NET framework version installed on computer lab computers, causing ArcMap to crash. The course staff needs to be prepared to deal with such scenarios, and understand that there might be weeks with higher workloads depending on the support needed from the class.

4. Course Evaluation and Lessons Learned

This section considers the topic of how to evaluate a course involving scenario planning theory and tools. After a brief discussion of the design and implementation of evaluation instruments, the second subsection will summarize lessons learned from each of the three universities where courses have been offered.

In addition to the typical student evaluations completed by most universities, instructors might consider implementing a pre-post course evaluation. If allowed, instructors may consider adding custom questions to standardized student evaluations. These optional questions could include familiarity with scenario planning concepts and tools, familiarity with collaborative planning concepts and approaches, their mastery of planning support system techniques, their grasp of the complexity and uncertainty of futures and the application of anticipatory governance, and the contribution of this course to their understanding of planning practice. In addition, since this kind of class draws heavily both on theory and technical skills, a survey at the beginning of the class could help the instructor better balance these two components depending on the interests and skills of the students.

Lessons Learned at the University of Texas

While creating an extra technical challenge for the students, students were eager to learn a state-of-the-art planning tool and gain experience that they could later use in practice, making them more attractive for employers. The ability to calculate performance and sustainability indicators helped the students understand the impacts of alternative land uses and densities, and the use of performance metrics was very strong in the future land use scenario posters. Using the software perhaps most importantly increased student exposure to large datasets including the return on investment (ROI) models. Student use and customization of development and building types proved to be a good way of exploring the land development market. Also, students could point to their ET+ analysis as a way of supporting their land use proposals, an improvement over speculative planning not based on market realities.

Drawbacks from Addition of ET+ Software

In terms of learning outcomes, it is legitimate to wonder if the addition of the ET+ software and the technical learning demands it presented may have lessened the learning outcomes from the more traditional areas of the course that teach good physical planning. Based on what the students produced for their final poster presentations, there were varying levels of strength in terms of utilizing the ET+ indicators, as well as the quality of their land use designs. Some groups may have produced thoughtful indicators, but were perhaps too invested in the metrics because their land use plans presented problems demonstrating a lack of comprehensive of basic land use planning principles, e.g., incompatible adjacent uses, designs lacking nodes or corridors, large out-of-scale areas of one development type, etc. Some

land use maps had poor visual layouts, perhaps lacking in annotation and limited by the tool's one-acre development type grid. Other groups, however, delivered beautiful land use maps and posters that very nicely portrayed the shift in outcomes between scenarios.

The instructors of this course are considering the capacity of students to learn a new software in addition to all the fundamentals of land use planning. In addition, it was difficult to teach an open-source tool, since documentation and training materials are uneven, and a large number of apps that have been developed for ET+. Instructors face a trade-off: is it worth teaching students the full library of apps or is it better to prioritize certain elements over others considering the time constraints of a semester?

Advice about Introducing Students to the ET+ Tool

In this course, the instructors dedicated an entire lecture to covering the ROI and Scenario spreadsheets. This was a session that we asked students to bring their laptops and download the spreadsheets before coming to class. This way they could follow along on their own machines, investigate specific elements in more detail if they wanted, and begin to understand the tradeoffs in the ROI spreadsheet as they made adjustments to physical and financial building attributes. The instructors also made available a library of building types used for Hutto, TX, which was a manageable collection of about 30 buildings for students to compare differences across a variety of project types, for example understand the impact of different parking layouts or densities on financial returns.

To supplement this introduction, the instructors had someone from the City of Austin give a guest lecture on how the city has used Envision Tomorrow in their planning efforts. As an exercise for the students, the guest speaker presented a specific redevelopment project to the students, and had them break into teams with each group modeling a future building project in an ET ROI model. To complete the assignment, students were required to transfer information from real-life planning documents into the spreadsheets, helping to reinforce where these elements were located in the spreadsheet and how they relate to the development process.

The spreadsheets were reviewed again at a later lab session, which was dedicated to getting the students up and running using ET and painting scenarios. The instructors concluded that the spreadsheets are intimidating for students because it is simply a lot of information to take on at one time. In addition, the spreadsheet navigation was probably challenging for some students. However, the real estate concepts and spreadsheet structure were reinforced through multiple sessions. While many students were definitely not familiar with real estate concepts coming into the class, the elements in the basic physical and financial worksheets actually help students better understand the development process, why/how things get built, and thus helps them as land use planners.

Technical Challenges

The instructors found the largest technical challenge in teaching ET was the unexpected issues that often come about when using open-source tools. Last year in particular we had challenges with version updates in both ArcGIS and ET. Other things such as installing ET on all the lab computers, and ensuring that they would all work for students come lab time. These challenges were somewhat hard to anticipate. For example, unexpected errors might effect only a portion of the computer lab.

However, the instructors were somewhat surprised at the lack of technical challenges students experienced when working on their final projects. This might be due to it being a team project, so the stronger GIS students found themselves using ET the most. The most challenging tasks for student were more minor issues which are nonetheless important for the analysis, such as file management, the 'scenario geodatabase' structure, saving files and ensuring that edits were saved, and loading building prototypes into the scenario builder correctly. The instructors were pleasantly surprised at the understanding of the spreadsheets and the initiative some students took to make significant modifications to building typologies in order to improve their land use plans.

In terms of the indicators, students had no problem interpreting them for the most part. However, only some students were able to successful present the indicators in an effective and meaningful way, and make the link between the indicators and a quality land use plan.

Lessons Learned at the University of Michigan

Although the University of Michigan course is being offered currently, some lessons have been learned in the design of the course. First, the course is able to draw on graduate students who have taken both GIS and planning theory recently, as well as a variety of other related classes. As a consequence, greater emphasis has been placed on a detailed examination of scenario planning theory, and reviewing a range of modeling tools. Second, since the course is open to students from a variety of planning concentrations, the assignments are developed in a way that allows students to focus on their own specialties and interests. For example, students are asked to focus on only several of the indicators of their choosing, rather than the complete list of indicators in the scenario construction and analysis assignment. Third, in order to ensure a manageable workload, we made several modifications. Some assignments were made into group assignments. Ideally, these group assignments not only reduce the individual workload but also enable students to complement each other’s knowledge and skill sets. The other is that we simplify the assignments by assuming that there was no existing development on our selected working site. Practically, assuming no existing development drops one of the most burdensome steps in setting up the project database and spare the students a huge amount of time to focus on the scenarios. Conceptually,

it is consistent with our aim of not letting existing development constrain students' envision of the site. At this moment, however, it is too soon to evaluate the success of the planned technical assignments.

Lessons Learned at the University of Utah

Although the University of Utah course succeeded in exposing practitioners to scenario planning tools, the limited number of credit hours meant students did not have the opportunity for sufficient hands-on technical work. In addition, not all students were planners, so some focused on more narrow uses of the technology, such as performing site-specific real estate analyses.

5. Scenario Planning Tools

Tools for scenario planning is a dynamic area, so this guide does not recommend a specific technology. Instructors should seek tools which can be readily integrated into the course material, are technically feasible given local resources, and provide students transferrable technical skills. The table below summarizes three which can be readily purchased or downloaded. In addition, many planning agencies have developed various tools tailored for their region which might be utilized for instruction.

	CommunityViz	**Envision Tomorrow**	**Index**
Developer	Orton Family Foundation, Middlebury, VT, Placeways, Boulder, CO	Fregonese Associates, Portland, University of Utah	Criterion Planners, Portland, OR
Year Developed	2001; 2004-2005	2004	1994
Summary of Approach	Spatial, GIS-based	Spatial, GIS- and Excel-based	Spatial, GIS-based
Scale	Building to regional	Building to regional	Place type to regional
Open Source Status	Proprietary with open access models	Open source, housed at University of Utah	Proprietary, in transition to open source
2D Map Visualizations	Yes	Yes	Yes
3D Visualizations	Yes	No	No
Cost	$500 (Self service support) and $850 per user (one year support and upgrades)_	Free	A standard version of Index PlanBuilder costs $1900
Requirements	Version 4.12, is compatible with ArcGIS 9.2 and up. Windows XP, Windows Vista, or Windows 7 (with MS. Net Framework 2.0 and DirectX 9.0) is required. A Windows operating system and at least the basic version of ArcGIS Desktop are required.	Requires Window XP or Vista, MS Office 2000 Pro or Greater, and Esri's ArcGIS desktop software 9.3 or greater. The tool supports all ArcGIS license types (ArcView, ArcEditor, and ArcInfo).	Desktop tool requires Windows, MS Office 2000 Pro with Access, and ArcGIS 9.3 Web tool operates on Windows or Linux servers using a PostgreSQL/ PostGIS database and a Phthon-centric application featuring Django, Mapnik, GEO/OGR, ExtJS, OpenLayers, and GeoExt
URL	http://placeways.com	http://www.envisiontomorrow.org	http://crit.com

Resources

Additional tools and a description of their strengths and weaknesses can be found in the following reports:

Condon, Patrick, Duncan Cavens, and Nicole Miller. 2009. *Urban Planning Tools for Climate Change Mitigation*. Policy Focus Report. Cambridge: Lincoln Institute of Land Policy.

Jim Holway, C.J. Gabbe, Frak Hebbert, Jason Lally, Robert Matthews, and Ray Quay. 2012. *Opening Access to Scenario Planning Tools*. Policy Focus Report. Cambridge: Lincoln Institute of Land Policy. (source of above table)

Instructors are also welcome to consult with OPTG members for advice on additional and emerging tools.

6. Course Profiles

In order to gather information about courses which are being offered in planning programs related to scenario planning and other novel tools, OPTG Curriculum Committee member Jenni Minner from Cornell University circulated a call for syllabi to the PLANET listserv of planning faculty. This survey resulted in seven syllabi.

Short course profiles of the three courses which most extensively involved scenario planning theory and tools are included on the following pages. The syllabi for all of the courses, listed below, are available online at the following URL: http://www.openplanningtoolsgroup.org/curriculum-material-library/

- Cities Place Technology: Seminar on Analytical and Participatory Tools – Jennifer Minner, Cornell University
- Community Planning Analysis: Land Use Modeling and Visualization – Jack D. Kartez, University of Southern Maine
- Concepts and Methods of Land Use – Jennifer Minner, Cornell University
- Public Sector Scenario Planning: Theory and Practice – Robert Goodspeed, University of Michigan
- Strategies for Planning Effectiveness – Alfonso Morales, University of Wisconsin – Madison
- Sustainable Adaptation of Large Modern Footprints – Jennifer Minner, Cornell University
- Urban Analysis – Jason Byrne – Griffith University

Course Profile: “Sustainable Land Use Planning”

Professor Bob Paterson (rgfp@austin.utexas.edu)
Teaching Assistant Tom Hilde (thom.hilde@gmail.com)
Taught Spring 2013, University of Texas at Austin

Course description

Sustainable Land Use Planning presents the nuts and bolts of land use planning as practiced in the US today. The course first provides background information on the history, institutional frameworks, purpose, principles and values inherent in land use and comprehensive planning as well as scenario planning as a contemporary development in physical planning practice. The second half of the course covers the analytic and participatory skills needed for preparing to undertake land use planning. The city of Hutto, Texas, a Sustainable Places Project demonstration site, served as the study area for the future land use analysis and planning.

2013 was a new departure in how the class was taught with the integration of a GIS-based scenario planning software tool, Envision Tomorrow Plus (ET+), to be used by the students to assess and compare the consequences of alternative future development scenarios. The class used the available demonstration project site dataset to use the software in a land use planning context, looking at how a city synthesizes its values, vision and analytic information through an iterative scenario planning process to create a future land use map and comprehensive plan components.

The course was not a studio format course – rather it was a survey of sustainable land use planning theories, methods and practices with an integrated software learning component to enable student use of a planning support system in completing a team project – a SWOTs and environmental constraints assessment and three future land use scenarios for a regional activity center. In order to prepare students for their final project analysis, ET+ learning modules were integrated into the course as special lab sessions or demonstrations from Sustainable Places Project practitioners.

Assignment sequence

Assignments 1-4 are team assignments. Form students into teams of 5-6 students each. Ensure that GIS proficiency is distributed equally between the teams

Assignment 1:	Plan Evaluation Exercise: Read and evaluate a comprehensive plan from a community in Central Texas. Readings include evaluation protocols that students should utilize to objectively rate the quality of the plan document.
Assignment 2:	Sustainability Indicators/Apps Analysis: Teams are required to research and describe 5 sustainability indicators, and then apply them to the existing conditions in the case study area (Hutto, TX). This lays the groundwork for a SWOTs analysis.
Assignment 3:	Physical Activity Center (Hutto, TX) – State of the Community Poster & Report (i.e. Strengths, Weaknesses, Opportunities, Threats). ET+ software utilized to generate sustainability indicators/trends and based on existing conditions.
Assignment 4:	Physical Activity Center (Hutto, TX) – Future Land Use Scenarios Poster and Presentation. ET+ used to compare two team scenarios with a trend development scenario for 2035. Teams plan, model and analyze two scenarios: 1) a community preference scenario; and 2) a ‘sustainability’ scenario in which community preferences are supplemented with strategies that achieve even greater sustainability impacts (i.e. pushing the bar). Deliverables for Assignments 3 and 4: a cumulative report, State of the Community poster (presented in interim and final reviews), and Future Land Use poster (presented in final review).

Assignment 5: Development Management – Implementation Tool Activity: Students research an implementation tool in the Sustainable Places Project development toolbox wiki. A short paper describes the implementation tool and a case study of its use in a sunbelt/southwest U.S./Texas context. Content is uploaded to further populate and/or improve the wiki.

Course topics and ET+ training sequence (2 sessions per week):

Part 1: Conceptual Framework for Sustainable Land Use Planning

- Course Introduction
- Sustainability and Theoretical Frameworks
- Institutional Frameworks to Pursue Sustainability: Planning from the State Level
- Institutional Frameworks to Pursue Sustainability: Planning from the Regional Level
- What makes a land use plan good or sustainable?
    - **Assignment 1 distributed**
- Alternate visions of sustainability: Rural by Design and New Urbanism
- **LAB SESSION: Scenario Planning and Introduction to Envision Tomorrow (Training Session 1)**
- Alternate visions of sustainability: Safe, Healthy, Fair and Smart Growth (2 parts)
    - **Assignment 2 distributed**

Part 2: Planning Systems

- Planning Support Systems and Performance Indicators
    - **Guest speaker demonstration of Land Use Information Systems and Databases**
- Visioning and Defining Community Values through Participatory Mapping
    - **Guest speaker demonstration of equity mapping and gentrification analysis using ET+**
- Environmental Systems 1: Soils, Agriculture, and Food Systems
- Environmental Systems 2: Aquatic Systems: Surface and Ground
    - **Guest speaker demonstration of ET+ Green Infrastructure App**
    - **SWOTs Assignment 3 distributed**
- Environmental Systems 3: Air, Energy and Climate Change
    - **Demonstration of relevant ET+ apps**
- Environmental Systems 4: Forests, Biodiversity and Hazard Zones
    - **Demonstration of ET+ i-Tree Street Tree app**

---------- Spring Break ----------

- State of the Community Report: SWOTs and Suitability Mapping
- **LAB SESSION: Taking Stock of Land Uses and Density (ET+ ROI Models as Basis for Land Use, learning activity with guest demonstration)**
- **LAB SESSION: Envision Tomorrow Training Session 2 – Land Use Scenarios and Indicators Analysis**
- Taking stock of Jobs and Housing
    - **Guest speaker demonstration of Balanced Housing app**
- Potable Water and Waste Water Infrastructure Systems
- Circulation Systems – Moving People, Goods and Services – Roads and Transit
    - **Guest speaker for MXD/7D apps**
    - **Assignment 3 SWOTs Poster/Report due**
- Circulation Systems – Bikes and Pedestrians – Intermodal Connections
    - **Assignment 4 (Future Land Use Scenarios) distributed**

Part 3 – Making Plans

- The planning process: Creating a Direction Setting Framework – Policy framework plans – Goals, Objectives, Policies, Actions
- Land Use Design 1: Planning Activity Centers and Corridors

- Land Use Design 2: Planning Neighborhoods and Housing Needs
- **WORK SESSIONS**
- **WORK SESSIONS**
- Activity Center Scenarios Analysis – Poster Presentations
    - **Assignment 5 Distributed**
- Final Paper and Poster Due
- Assignment 5 e-submitted and uploaded to Toolkit Wiki

Course Profile: "Public Sector Scenario Planning: Theory and Practice"

Professor Robert Goodspeed (rgoodspe@umich.edu)
Taught Winter 2015, University of Michigan

Course Description

This course is a newly-designed course offered in the University of Michigan Urban and Regional Planning Program. It is an elective with some prerequisites described below.

Growing uncertainty about the future has made considering the long-term implications of public actions more difficult than ever. All planning specialties must now consider uncertainties associated with forces like climate change, new technologies, economic restructuring, and changing social preferences. Given the failure of conventional methods of prediction, professionals are increasingly turning to scenario planning. Instead of proposing only a most likely or must desired future scenario, practitioners using scenario planning seek to construct multiple possible futures. Doing so requires combining art with science: applying not only creativity but also rigorous analysis. The goal of scenario planning is to make better plans and decisions by challenging assumptions and encouraging learning.

The goal of the course is to introduce students to this exciting professional technique, as well as provide hands-on experience using GIS-based planning support systems (PSS) used to implement scenario planning. This course contains four modules: (1) an overview of scenario planning theory and concepts, (2) an exploration of applications of the method in various sub-fields of urban planning, (3) an exploration of some of the modeling tools used for scenario planning, and (4) an opportunity to use leading PSS tools to construct scenarios and explore their economic, land use, transportation, and environmental dimensions. The course will involve readings, discussion, and a series of individual and group assignments which culminate in detailed student-generated scenarios for a site in Ann Arbor where large-scale development has been proposed.

Student Audience and Prerequisites
The course is designed for students from all concentrations in the Masters of Urban Planning program, as well as students interested in this planning method from across the University. However, UP 540 (Planning Theory) and UP 506 (Intro. to GIS) or equivalent courses are required prerequisites. Students without these prerequisites but with adequate background in these topics can enroll with the permission of the instructor.

Materials
- Hopkins, Lewis D., and Marisa Zapata. 2007. *Engaging the Future: Forecasts, Scenarios, Plans, and Projects*. Cambridge, Mass.: Lincoln Institute of Land Policy. (Referred to below as "ETF")
- Journal Articles, Reports, and other publications.

Course Overview and Assignments

Scenario planning has emerged as an influential professional technique in urban planning and related fields since responds to planning's concern with holistic analysis, future-oriented thinking, and the importance of uncertainty. Scenario planning most accurately refers to a diverse area of planning practice which involves a diverse array of assumptions, tools, and methods. As a consequence, the course has two primary learning objectives for graduate students in planning: to cultivate *reflective practitioners* and to provide specific technical skills to empower students to implement these ideas themselves or by working with a team.

Reflective Practitioners: Theory, Method, and Cases
The primary goal of this class is to cultivate *reflective practitioners* (Schön 1983), who are prepared to implement forms planning appropriate to the questions and problems they will face in their lives and as professionals. To do this, the course provides an introduction to theories, debates, and modeling tools used in scenario planning. Students then consider how these ideas have been translated into

contemporary practice through the study of three cases: Envision Utah, Great Lakes Shorelands, and the Central New Mexico Climate Change project. In many advanced scenario planning projects, urban planners involved work with consultants and multifunctional teams to integrate scenario creation, stakeholder engagement, and modeling and analysis. Therefore, the course examines several advanced modeling tools in detail, in order to empower future planners to be educated consumers of tools used in practice. Through scholarly articles and technical documentation students examine a range of tools for sketch planning and urban modeling, examining their logic, assumptions, weaknesses and strengths.

Technical Skills: Ann Arbor Project
The second aim of this course is to provide specific technical skills to implement one approach to scenario planning feasible to implement within the confines of the course. As summarized below, working both individually and in groups, the class will collectively create two scenarios for the selected project site in Ann Arbor: a predictive scenario will *forecast* the future, and a trend scenario will propose how the neighborhood might be *transformed*. If allowed by sufficient class size, the class may also create an explorative scenario to test *strategic* possibilities (Börjeson et al. 2006, W4).

Assignments:
The schedule and diagram below provide a description of how these assignments are related, and are linked to the course readings and cases.

A1 Futures Method Report: Working in assigned groups, the students are asked to review materials for one of several alternative planning methods: visioning, strategic planning, general or comprehensive planning, forecasting, and utopian imagination. This assignment reinforces the unique nature of scenario planning, but also begin to explore how ideas might be fruitfully combined in practice.

L1 Stakeholder Identification: The class considers the multiple stakeholders for the physical development of the project site, identifying the key issues for each stakeholder.

L2 Project Context Research: Each student is asked to prepare summary slides exploring issues identified by the stakeholder identification assignment.

L3 Scenario Narrative Development: Drawing on their emerging understanding of the site, students work in small groups to construct four scenarios by selecting two major uncertainties and placing them on two axes.

L4 Building Prototype Exercise: Working individually, students construct building prototypes which might be used for either a *forecast* or *transforming* scenario.

L5 Development Type Exercise: Next, using the buildings created in the previous assignment, also working individually, students will create development types which could be used for either scenario.

L6 Suitability Analysis: Next, students will create a suitability map for their development type for the project site using a simplified attractiveness and constraint raster analysis.

A2 Tool Report: Working in small groups, students present on various scenario planning tools.
L7 Scenario Construction: Finally, the big moment has arrived! In a participatory workshop setting, working in two groups, the students will sketch and refine the scenarios, drawing on the suitability analysis and development type indicators.

L8 Scenario Analysis: Working individually, students implement a site-level transportation analysis.

L9 Scenario Visualization & Communication: Students will work in groups to produce representations of their scenarios, which will be used for the final presentation. This includes charts, tables, maps, and/or 3D representations from CityEngine.

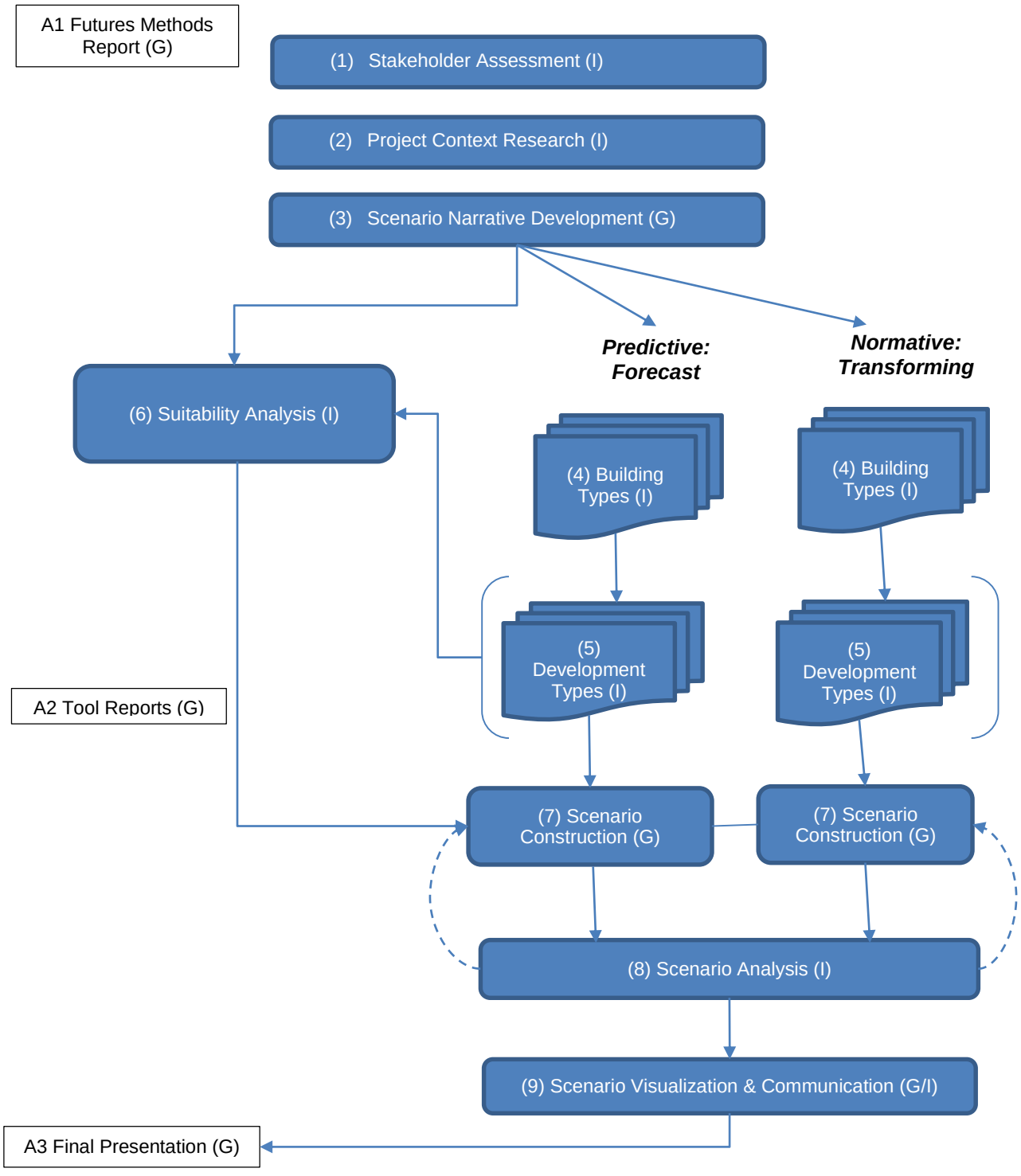
A3 Final Presentation: Using the outcomes from the previous labs, the class as a group prepares and deliver a summary presentation open to Taubman College and invited stakeholders.

Schedule

Week	Modules	Topics	Assignments	Cases or Tools
1	1: Introduction to SP Theory and Practice	Introduction		
2		SP and Its Alternatives	A1: Futures Method Report	
3		SP Origins and Concepts	L1: Stakeholder Identification	
4		Scenario Types & Construction	L2: Project Context Research	
5		Participation	L3: Scenario Narrative Development	
6	2: Practice Areas	Environmental Planning	L4: Building Types	Envision Utah
7		Urban Land Use and Transportation	L5: Development Types	Great Lakes Shorelands
8		Climate Change	L6: Suitability Analysis	Central New Mexico
9	3: Modeling Urban Scenarios	Modeling Introduction & Sketch Planning	A2: Tool Report	CommunityViz, Index, Envision Tomorrow+, What If?
10		Advanced Modeling 1: Econometric Land Use &Transportation	L7: Scenario Construction	UrbanSim and Urban Strategy
11		Advanced Modeling 2: Spatial & Systems Dynamics	L8: Scenario Analysis	LEAM, Systems Dynamics
12	4. Advancing Practice & Final Presentations	Scenario Visualization & Communication	L9: Scenario Visualization & Communication	CityEngine
13		SP as a Sociotechnical Infrastructure	Draft Presentation	
14		Conceptualizing & Measuring Learning	A3: Final Presentation	
15		Close & Party		

See online syllabus for complete reading list.

Overview of Laboratory Assignments



Key
(G) – Group Assignment
(I) – Individual Assignment

Course Profile: "Scenario Planning in Envision Tomorrow Plus"

Offered Summer 2014 at the University of Utah

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Introduction

Although used in business management since the 1960s, scenario planning has been widely disseminated among urban planning practitioners primarily over the last decade. The promise of scenario planning is that it allows people and planners make decisions in a comprehensive way, considering a wide range of possible outcomes of specific actions. Envision Tomorrow Plus (ET+) is an innovative set of urban and regional planning tools that can be used to model development feasibility on a site-by-site basis as well as create and evaluate multiple land use scenarios, test and refine transportation plans, produce small-area concept plans, and model complex regional issues. This course focuses on providing theoretical backgrounds of scenario planning as and emerging trend in urban planning and understanding how to develop scenarios by using Envision Tomorrow Plus (ET+) – the most recent scenario planning tool developed so far.

Course Objectives

This training session has three main course objectives which are:

- **Understanding**
  - ✓ the basic theory of scenario planning and the basic structure of the Envision Tomorrow Plus software as a computer-aided scenario planning tool.
  - ✓ more detailed data structure of ET+ such as fitting existing land use data from various sources into ET+ land use categories, inputting numeric land uses, estimating developed/vacant acres, etc.

- **Learning**
  - ✓ how to build up building prototypes and manage the scenario spreadsheet assuming t0hat all parcel-level data are secured.
  - ✓ detailed preliminary setup functions and cleaning up the existing condition data deriving from various data sources

- **Practicing**
  - ✓ painting multiple scenarios by using ET+ and interpreting the summarized outcomes of each scenario.
  - ✓ how to create a file geodatabase, define subareas, and use various app tools in painting scenarios at various scales

Teaching & Learning Methods

This course consists of lecture and lab components, but most part of the course will be concentrated on providing students and professionals with hand-on experience in GIS-based scenario planning by operating Envision Tomorrow Plus. The lecture components will focus on some theoretical aspects of scenario planning, its current practical issues, and managing the scenario planning process. Reading assignments will also be given to further students' understanding of scenario planning and Envision Tomorrow Plus. A final project assigned to both student and planning professionals will also provide students and professional participants with an opportunity to apply scenario planning and Envision Tomorrow Plus to their various

planning practice. During the course, active discussion of scenario planning and ET+ will be highly recommended and encouraged to share understanding of scenario planning and ET+ in the long term.

- Lab assignments (20 pts each, 60 pts in total, applied only to students)
  - ✓ Three lab assignments will be given to students to further understanding of scenario planning and Envision Tomorrow Plus. Outcomes of each assignment will be used as components for students' final projects. Therefore, students should be well-prepared for each lab assignment.
  - ✓ Lab assignments must be submitted through Canvas.
  - ✓ To do your assignments effectively, saving your work and asking questions will be strongly recommended.
  - ✓ The deadline for each lab assignments is due midnight of the next class date.

- Final project (30 pts)
  - ✓ In the final project, students will be required to build several different scenarios for the site given at the first day of the class, analyze the results of each scenario, and suggest one final preferred scenario.
  - ✓ Evaluation of the final project will be based on the quality of components used for scenarios, analytic ability of scenarios, and feasibility and rationales of one final preferred scenario they suggest. More information about the final project will be given in the class, and questions about the final project are always welcomed.
  - ✓ As with lab assignments, the final project works must be submitted via Canvas.
  - ✓ The deadline for the final project is due midnight, Aug 1, 2014.

Course Schedule

The schedule of the course and associated reading and lab assignments are listed in the table below. Please note that this schedule is subject to change in the event of extenuating circumstances.

Date	Topic	Lab Session	Readings
Jun 19	▪ Course introduction ▪ Brief Introduction of Scenario Planning ▪ Brief introduction of ET+ ▪ ET+ Prototype Builder **Lab assignment 1 distributed**	✓ ArcGIS 101 ✓ Setting up ET+ ✓ Producing a building prototype	✓ Holway et. al. Chap 1 & 2 ✓ User Manual p. 1 – 28/ p. 79-84
Jun 26	▪ ET+ Scenario Builder **Lab assignment 1 due** **Lab assignment 2 distributed**	✓ Producing a development type ✓ Inputting data into Scenario Builder	✓ Holway et. al. Chap 3 ✓ User Manual p. 29 – 42/p. 67-78
Jul 3	▪ ET+ filegeodatabase **Lab assignment 2 due**	✓ Preparing scenario shapefile layers ✓ Creating a filegeodatabase	✓ User Manual p. 43-46/ p. 61-66/p. 85-104
Jul 10	▪ Painting scenarios in ET+ ▪ Interpreting scenarios ▪ ET+ Analytic tools (I) **Lab assignment 3 distributed**	✓ Opening a filegeodatabase in ET+ ✓ Synchronizing data ✓ Painting scenarios ✓ Interpreting Summary New/Total tabs in Scenario Builder	✓ User Manual p. 105-120/p. 129-131

		✓ Attribute field manager ✓ Redevelopment candidate app ✓ Local jobs-housing balance	
Jul 17	▪ ET+ Analytic tools (II) ▪ Standalone ET+ spreadsheets **Lab assignment 3 due**	✓ Accessibility functions (7Ds, Proximity summary, etc.) ✓ Standalone ET+ spreadsheets (Travel Model, Fiscal Impact Tool, Balanced Housing Model) ✓ Future issues of scenario planning tools	✓ Holway et. al Chap 4 & 5 ✓ User Manual p. 132 – 146
Aug 1	**Final project report submission (Students & Professionals)**	No lab	No readings