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Creating Healthy and Just Bioregions

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Abstract

Dramatic changes taking place locally, regionally, globally, demand that we rethink strategies to improve public health, especially in disadvantaged communities where the cumulative impacts of toxicant exposure and other environmental and social stressors are most damaging. The emergent field of sustainability science, including a new bioregionalism for the 21st Century, is giving rise to promising place-based (territorially rooted) approaches. Embedded in this bioregional approach is an Integrated Planning Framework that enables people to map and develop plans and strategies that cut across various scales (e.g., from regional to citywide to neighborhood scale) and various topical areas (e.g., urban land use planning, water resource planning, food systems planning and "green infrastructure" planning) with the specific intent of reducing the impacts of toxicants to public health and the natural environment. This paper describes a case of bioregionally inspired Integrated Planning in San Diego, California (USA). The paper highlights food-water-energy linkages and the importance of "rooted" community-university partnerships and knowledge-action collaboratives in creating healthy and just bioregions.

Keywords

Sustainability Science; Bioregion; Rootedness; Integrated Planning Framework; Green Infrastructure

Introduction

The first decades of the 21st Century are revealing mounting socio-ecological problems that are increasingly complex and interconnected (e.g., climate change vulnerabilities, economic and environmental injustices, ecological degradation, large scale toxic disasters, and rising food and water insecurity). At the same time, promising new integrative approaches, policies and technologies are emerging to collaboratively deal with such problems. Researchers using "Sustainability Science" are producing integrative, place-based approaches including initiatives and projects with a strong commitment to civic engagement.

Sustainability Science

Sustainability Science has four defining features: [1] it embraces an integrative (transdisciplinary) approach to research that is use-inspired, problem-solving and solutions-oriented; [2] it underscores how regions are a useful scale of analysis for understanding the interaction of local and global dynamics (glocalization) in the study of place-based socio-ecological phenomena, including the coupling of human and natural systems in the (re)production of society's built environment; [3] its proponents share a commitment to creating "knowledge-action collaboratives" that bring together diverse participants in mutually supportive learning networks; and [4] it has a normative and ethical dimension that values the democratization of science and technology and what the National Research Council has called a "transition toward sustainability," improving society's capacity to use the earth in ways that simultaneously "meet the needs of a much larger but stabilizing human population, . . . sustain the life support systems of the planet, and . . . substantially reduce hunger and poverty" (1, p1737). Of course, there is great variation around the world in the way planning, social mobilization, megatrends and change unfold locally and regionally. Nonetheless, it is reasonable to argue that certain global megatrends are converging in what Pezzoli (2) has termed the *Bioregionalization of Survival*.

> "Bioregionalism is a social movement and action-oriented field of study focused on enabling human communities to live, work, eat, and play sustainably within Earth's dynamic web of life. At the heart of the matter is this core guiding principle: human beings are social animals; if we are to survive as a species, we need healthy relationships and secure attachments in our living arrangements with one another and with the land, waters, habitat, plants, and animals upon which we depend" (3, p1).

Berg and Dasmann (4, p400) coauthored one of the first documents in the United States to spell out the meaning of "bioregion": "The term refers both to geographical terrain and a terrain of consciousness—to a place and the ideas that have developed about how to live in that place." A bioregion's boundary is not fixed. It takes into account factors including climate, topography, flora, fauna, soil, and water together with the territory's sociocultural characteristics, economy, and human settlement patterns. Thayer (5, p55), a widely noted bioregional activist-scholar, aptly argues that "the bioregion is emerging as the most logical locus and scale for a sustainable, regenerative community to take root and to *take place.*" That a bioregion is a fruitful place-based organizing concept stems from the premise that "a mutually sustainable future for humans, other life-forms, and earthly systems can best be achieved by means of a spatial framework in which people live as rooted, active, participating members of a reasonably scaled, naturally bounded, ecologically defined territory, or *life-place*" (5, p6).

The Bioregionalization of Survival

Bioregionalization of Survival (BOS) is best understood as a heuristic. It is a broad working hypothesis (i.e., storyline, narrative) articulated for purposes of helping organize thinking and action where place-based context and theories of change are needed for the transition to sustainability. BOS contextualizes in territorial terms the challenges of enabling healthy

placemaking. To varying degrees, and in diverse ways, many cities, towns and regions around the world are experiencing the onset of a BOS localization dynamic. BOS is a convergence of megatrends that is bringing about significant changes in how our built environments, infrastructure and working landscapes/waterscapes are organized and operated from a coupled human-natural systems perspective.

BOS has two main defining features: [1] a shift to increasingly endogenous (localized) strategies and means of economic development as compared to the contemporary mainstream exogenous (export led industrialization) emphasis in economic development; and [2] an intensification in the ways local bioregional sources of natural capital (e.g., soil, water, ecosystems) and natural sinks for wastes (e.g., toxicants) are intentionally designed into economic systems as well as built environments for purposes of realizing sustainable and resilient development. Built environments include, for instance, residential areas, business complexes, infrastructure, and working landscapes BOS is an emergent process. It is visible where societies have begun grappling with complex socio-ecological problems by establishing place-based, territorial approaches to securing health and wellbeing for their residents (6).

Green Regionalism

In the context of urban planning theory and practice, urban planning scholar Timothy Beatley (7) suggests that “a true shift toward sustainability ultimately will require what I call *green regions*: spatial units that mix urban settlements with surrounding hinterlands and ecosystems and that together yield compact, sustainable cities and settlement patterns” (7, p. 140). Beatley (7) suggests that we take a holistic view of *green regionalism*, considering it from the perspectives of ecology, biodiversity, sustainable urban form, resilience, and “sustainable metabolism.” As a result, “part of the goal in regional sustainability planning will thus be to ensure that a region is able to satisfy a significant amount of its own biophysical needs, namely water, energy and food” (7, p 164).

One important yet challenging aspect of *green regionalism* is recognizing how green regions of the future will connect to other regions and the rest of the world, and how local plans and actions are connected to regional and global outcomes. Beatley (7) suggests that in terms of setting realistic goals for green regions, we consider “self-reliance” as a way to measure our progress, and that we consider a concept of *glocalism*, which holds that regions have a duty both to shift to the local and regional and to recognize and accept their global duties and responsibilities that reflect the inherent interconnectedness of the planet” (7, p169–170).

Integrated Planning Framework

As described above, the concepts of bioregionalism and green regionalism we discuss in this paper draw inspiration from Sustainability Science, as well as urban planning theory and practice. Stephen Wheeler has observed that “one of the paradoxes of planning is that many social and environmental problems are best approached at a regional scale, but this is usually the weakest level in terms of government institutions and public understanding” (8, p263). This paradox is clearly one of the major challenges in looking at a bioregion as the

appropriate scale in which to develop plans and strategies that focus on human health and ecological health while giving due consideration to the socio-ecological justice implications of our proposed solutions. Recognizing this paradox has led urban planners toward the use of an “Integrated Planning Framework” for analyzing problems and identifying spatially-based solutions within a complex planning and regulatory environment.

In its simplest form, an *Integrated Planning Framework* (IPF) looks at plans and policies from two main perspectives:

- Topical Areas – understanding the characteristics of plans and policies that are focused on particular topical areas of place-based planning (e.g., land use, transportation, housing, economic development, environmental systems, infrastructure, and natural hazards) and
- Geographic Scale – understanding the characteristics of the various scales at which urban and environmental plans and policies are being developed (e.g., regions, cities, communities, and small areas such as neighborhoods, corridors, and activity centers).

The IPF concept is drawn from many years of urban and environmental planning research and practice. In 2004, Professor David Godschalk (9) set forth the concept of an “integrated framework of plans” (also described as a “network of plans”) to illustrate how comprehensive plans could address the topics of land use, transportation, economic development, housing, and the natural environment in a systematic and integrated fashion, and could also be viewed in terms of their scalar integration: from *Regional* Level to *City* Level to *Small-area* Level (9, p10).

More recently, the concept of an *Integrated Planning Framework* has been further refined in the American Planning Association (APA) Planning Advisory Service Report on “Sustaining Places: The Role of the Comprehensive Plan” (10). For example, this report includes an expanded discussion of the concept of *vertical integration* of comprehensive plans across geographic scales, including not just Regional scale, City scale and Small-area scale, but more specifically at the county, rural, community and “master plan” scales (see Figure 1).

The authors also assert that “the region is the most appropriate scale to comprehensively address sustainability because the resources to be sustained are, at a minimum, regional – whether related to the environment (air, water, and habitat), the economy (labor, jobs, infrastructure, and physical capacity), or social equity (fair housing and access to opportunities" (10, p47). The report provides several examples of local and regional comprehensive plans that are designed to lead toward sustainable outcomes, and describes various ways in which horizontal integration (across topical areas) and vertical integration (across scales) of plans and policies can be achieved.

Integrated Planning for Sustainability

The APA “Sustaining Places” report addresses not only the importance of vertical and horizontal integration of plans, but also emphasizes the need to include a clear definition and

corresponding principles for “sustainability” itself. The report begins with a proposed definition of planning for “sustaining places” as follows:

> “Planning for "sustaining places" is a dynamic, democratic process through which communities plan to meet the needs of current and future generations without compromising the ecosystems upon which they depend by balancing social, economic, and environmental resources, incorporating resilience and linking local actions to regional and global concerns” (10, p4).

The report next identifies eight principles for best practices that can guide comprehensive planning for sustaining places, as shown in Table 1:

These principles can be summarized as follows:

- Principles 1 to 5 are focused on **Plan Content**, and identify the key topical areas and associated outcomes that should be addressed in a local comprehensive plan.
- Principle 6 speaks to **Vertical Integration**, the importance of connecting local plans and policies to those of adjoining jurisdictions and the region as a whole.
- Principles 7 and 8 address two key components of the **Planning Process**:
  - *Authentic Participation* through active involvement by all segments of the community; and
  - *Accountable Implementation* through clear delineation of implementation responsibilities and identification of metrics for measuring progress in achieving desired outcomes.

Authors of other recent publications from the American Planning Association (the leading professional organization for urban and environmental planners in the United States) have been using this evolving concept of *Integrated Planning Framework* as a way to help planners who are focusing on sustainability to consider, among other things, the important interrelationships among key topical areas, while also understanding the important interrelationships between plans and policies at different scales.

Glocalizing Sustainability Science through an Integrated Planning Framework

The co-authors of this paper, along with other instructors and researchers in the UC San Diego Urban Studies and Planning Program, have recently launched the *Center for Sustainability Science, Planning and Design.* The Center, also known as SS-PAD, includes three current areas of focus:

1. *Integrated Planning Framework:* The Center team is conducting further research and development of the concept of Integrated Planning Framework (IPF) as a systematic approach for organizing, preparing and implementing urban and environmental plans, and is providing assistance to public planning agencies and other clients in applying this framework to their own planning activities.

2. *Core Resources:* The Center team is developing a set of tools and techniques (including software, analytical models, visualization tools, civic engagement techniques, etc.) that can be used in the preparation of urban and environmental plans and projects.

   A key component of the Core Resources for the Center is the *Spatial Analysis and Planning Toolbox (SAPT)*, a set of GIS-based modeling tools for preparing, analyzing, and visualizing alternative land use/transportation scenarios at the neighborhood scale. These tools will support expanded and innovative work in *scenario planning*, which is a rapidly evolving technique for evaluating alternative land use, environmental and transportation scenarios and their effects on key urban and environmental systems, producing analytical reports, and using visualization to help stakeholders understand the implications of different policy choices.

3. *Strategic Initiatives*: The Center team is engaged in the preparation of plans, projects and strategic actions that will be designed to address specific urban and environmental planning problems, primarily at a neighborhood scale. The Strategic Initiatives cultivate knowledge, techniques, and actions using the Integrated Planning Framework and supported by the Center's Core Resources.

Model Development and Demonstration Projects: Toxicant mitigation

One of the first tools that is under development by the Center is a neighborhood-scale Water Quality model that enables us to evaluate the relationship between various types of urban land uses (on vacant or underdeveloped properties) and the estimated volume of stormwater (which may contain waterborne pollutants) that is discharged into the existing stormwater collection system. At the same time, we are developing the capability to evaluate the relationship between the presence of "brownfield" hazardous toxicants in the soil, and potential risks to public health through direct exposure to these toxicants as well as the potential for these toxicants to drain into the stormwater system and eventually into environmentally sensitive waterbodies. The purposes of this research include not only addressing the localized environmental impacts of urban development, but also to identify ways in which proper mitigation measures can lead to improvements in brownfield toxics management at a communitywide level, and in improving water quality at the regional (watershed) scale.

In early 2014, the UC San Diego Superfund Research Center designated the Euclid/Market Trolley Village study area in Southeastern San Diego as a "demonstration project area." This area is a disadvantaged urban "infill neighborhood" located in the Chollas Creek Watershed, a heavily polluted drainage area that flows into San Diego Bay. An "infill neighborhood" is a place where the amount of available land, and demand for development, is high enough for land use densification to take place (i.e., increasing the number of dwelling units, or office spaces on a particular parcel of land).

For the demonstration project, USP faculty and researchers selected C*ommunity Viz*, a GIS-based software platform for data integration, analysis, modeling, visualization and scenario

planning. This team then worked with national environmental and modeling experts from Placeways LLC, Birchline Planning, and Hey and Associates to develop the *CommunityViz* Water Quality scenario planning model, which also incorporates the ESRI *ArcHydro* flow path model. The "flow path model" enables one to visualize and make use of data featuring the flow of rainwater and urban runoff over the land surface of a particular area of interest. The model uses coefficient-based modeling and analytical capabilities to allow planners to estimate the costs and benefits of various types of stormwater mitigation strategies that are relevant to urban infill development projects, including urban agriculture land uses such as community gardens and food forests.

In our demonstration project we used the *CommunityViz* Water Quality Model to evaluate hypothetical site plans for two different types of multi-family residential development on a 2.6 acre vacant site at Euclid Avenue and Market Street in the Encanto Community in southeastern San Diego. The demonstration project also looked at two different approaches for meeting stormwater mitigation requirements for the projects pursuant to the latest regulations promulgated by the San Diego Region Water Quality Control Board (SDRWQCB) for the Chollas Creek Watershed, in which the project site is located. The new regulations, which set strict limits on how much stormwater can run off a particular property, will be incorporated into the Water Quality Improvement Plan that is currently being developed for the Pueblo/Chollas Creek Watershed for eventual approval by SDRWQCB. These new regulations are intended to reduce the flow of contaminated urban runoff into San Diego's waterways and coastal zone.

The first set of stormwater mitigation scenarios assumed that all mitigation requirements would be met through on-site control measures. The second set of scenarios assumed that 50% of mitigation requirements would be met through on-site measures while the other 50% would be met through offsite "green infrastructure" measures to be installed on a future city park site. The results of the analysis indicated that the estimated costs to the developer of using 100% on-site vs. 50% on-site / 50% off-site mitigation measures were comparable. However, the use of off-site measures would lead to additional community benefits by providing funding to the city to help cover the costs of future park development.

We are now initiating the next phase of this effort, which will focus on developing additional functionality in the *CommunityViz* Water Quality Model to allow more detailed evaluation of specific mitigation strategies that would potentially reduce stormwater pollution, including suspected brownfield toxics in the soil on certain vacant sites. The next phase of model improvements will also allow us to estimate the volume of stormwater that may be recaptured and re-used for domestic purposes such as landscape irrigation. Our approach allows us to estimate the costs and benefits of "green infrastructure" solutions (e.g., neighborhood parks, ecological restoration projects, community gardens and food forests) to address stormwater pollution and brownfield toxics remediation requirements at a regional and local scale.

We also intend to leverage this effort to allow analysis of scenarios that can illustrate prospective co-benefits of urban agriculture, including de-carbonization of food production and distribution in ways that can reduce greenhouse gas emissions and reduce climate

change impacts. Our research will use enhanced scenario planning tools to evaluate real-life environmental, economic and social issues involving community gardens and food forests. In addition, we are currently developing an “urban agriculture suitability mapping” tool that will allow planners and community stakeholders to identify sites within an urban neighborhood that are most suitable for a variety of different types of urban agriculture uses. The suitability analysis will include identification of those sites which can help meet stormwater pollution reduction goals, as well as sites that could benefit from reuse of stormwater for irrigation. In addition, it will allow us to flag those sites which may contain brownfield toxics, so that the possible presence of such toxics can be further evaluated, and in some cases can be mitigated through appropriate siting and design.

It is also important to emphasize that the results of our research and analysis are being translated into terms that can be well understood by a variety of community stakeholders. For example, the UCSD Superfund Research Center recently completed Phase I and Phase II Environmental Assessments for the Ocean View Growing Grounds, a community garden project which is a joint effort of UCSD Superfund Research Center and the Global Action Research Center. Following completion of this assessment, which identified brownfield toxic contaminants in isolated locations on the site, a UCSD SRC researcher put together a presentation for community participants in the project to explain the results and their implications for urban agriculture activities. The presentation put the results in the context of national and state standards for these toxicants, and explained how, with proper precautions, the presence of these toxicants does not pose significant risks to the participants. The presentation provided a practical and understandable explanation of the results in a way that was well received by its audience. We intend to provide similar presentations and on-line informational materials to other community members so that they can get a better understanding of ways that they can safely conduct community gardening and backyard gardening activities in their neighborhoods.

Conclusions

The emerging realm of Sustainability Science calls for the strategic application of advanced scientific research to solving real-world problems. These problems often occur at a localized scale, but create cumulative impacts that can have deleterious effects on bioregional and even global environmental systems. Striving to create healthy and just bioregions is one way to proactively approach the problems posed by human exploitation of the earth’s stocks and flows of natural capital. The concept of bioregional justice shares the concerns of environmental justice, but does so in a way that also highlights ecosystems as common good assets, and human–nature relations as manifest in human settlement patterns at a regional scale.

Bioregional justice integrates multiple layers of justice (e.g., social, economic, environmental, global) by advancing a unifying place-based approach to improving the land, ecosystems and urban–rural relationships in a particular bioregion. Bioregional justice ensures that the benefits, opportunities and risks arising from creating, operating and living in a territorially bounded network of human settlements (i.e. a bioregion where urban–rural–wild- land spaces co-evolve socially, culturally and ecologically) are shared equitably

through healthy relationships and secure place-based attachments. Bioregional justice seeks equity and fairness in how a bioregion's assets—including nature's sources, sinks and ecosystems needed for life and living—are accessed, utilized and sustainably conserved for current and future generations (6).

Research universities can play an important role in advancing the constructive use of Sustainability Science and actionable Bioregional Theory by creating institutions that:

- Promoting a better understanding of the framework in which effective Integrated Planning can be used to address urban and environmental problems at all relevant scales;
- Building spatial analysis and visualization tools at the neighborhood scale that allow planners and scientific researchers to work together through demonstration projects that allow testing of scientifically-based solutions to urban and environmental problems; and
- Developing strategic initiatives that combine the best available analytical tools and techniques with authentic community and stakeholder participation that will lead to meaningful and lasting results.

The ability to understand the Integrated Planning Framework in which urban and environmental planning is taking place in a particular bioregion is an important part of the overall effort to glocalize Sustainability Science. Such an understanding can help planners and researchers to ensure that localized strategies and actions are designed for maximum effectiveness, and will also allow systematic monitoring in relation to desired outcomes. At the same time, by understanding this framework, planners can also help to ensure that plans that are designed to address these problems are both horizontally and vertically integrated so that the maximum benefits can be attained at each relevant scale.

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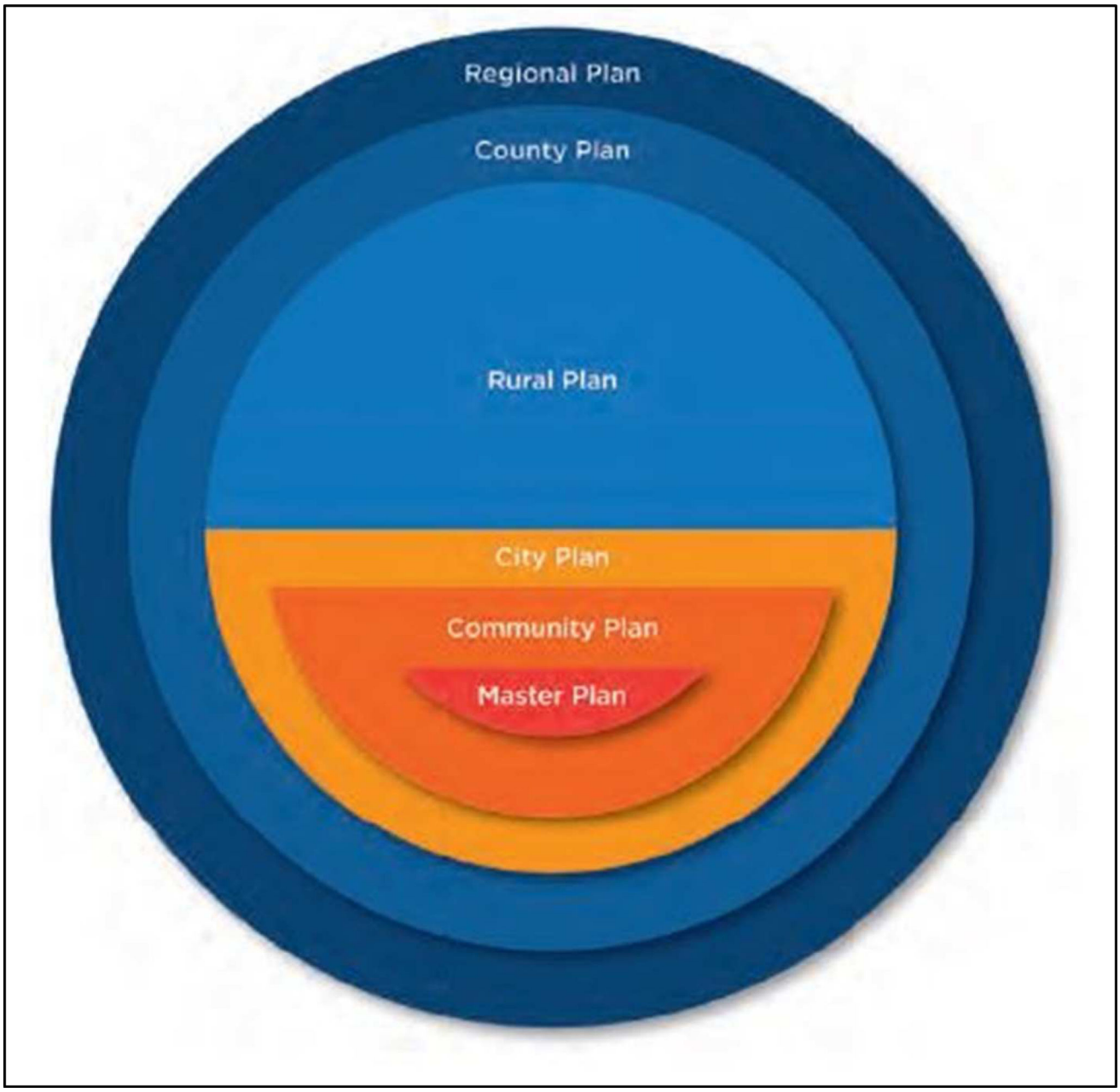

Figure 1.
An Illustration of the interrelationships of plans across geographic scales
Source: Godschalk and Anderson [10, p54]

Table 1

APA Sustaining Places Initiative: Planning Principles for Comprehensive Plans

PRINCIPLES
Plan Content:
1. **Livable Built Environment:** Ensure that all elements of the built environment—including land use, transportation, housing, energy, and infrastructure—work together to provide sustainable, green places for living, working, and recreation, with a high quality of life.
2. **Harmony with Nature:** Ensure that the contributions of natural resources to human well-being are explicitly recognized and valued and that maintaining their health is a primary objective.
3. **Resilient Economy:** Ensure that the community is prepared to deal with both positive and negative changes in its economic health and to initiate sustainable urban development and redevelopment strategies that foster green business growth and build reliance on local assets.
4. **Interwoven Equity:** Ensure fairness and equity in providing for the housing, services, health, safety, and livelihood needs of all citizens and groups.
5. **Healthy Community:** Ensure that public health needs are recognized and addressed through provisions for healthy foods, physical activity, access to recreation, health care, environmental justice, and safe neighborhoods.
Vertical Integration:
6. **Responsible Regionalism:** Ensure that all local proposals account for, connect with, and support the plans of adjacent jurisdictions and the surrounding region.
Planning Process:
7. **Authentic Participation:** Ensure that the planning process actively involves all segments of the community in analyzing issues, generating visions, developing plans, and monitoring outcomes.
8. **Accountable Implementation:** Ensure that responsibilities for carrying out the plan are clearly stated, along with metrics for evaluating progress in achieving desired outcomes.

Source: Godschalk and Anderson [10, p11–19]