Carrying Capacity and the Comprehensive Plan: Establishing and Defending Limits to Growth

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CARRYING CAPACITY AND THE COMPREHENSIVE PLAN: ESTABLISHING AND DEFENDING LIMITS TO GROWTH

Jonathan Douglas Witten*

Abstract: Natural and built resources have finite capacities for assimilating growth and associated impacts. The use of analytical tools such as carrying capacity analyses is recommended to assess the cumulative impact of land development upon these resources. Once carrying capacity thresholds have been established, local governments should apply appropriate regulatory controls to ensure that capacities are not exceeded. The application of carrying capacity tools is suggested in all jurisdictions, including states that do not mandate the preparation of comprehensive plans. The adoption of carrying capacity regulations may trigger a regulatory takings analysis. Adoption of legislative actions to preserve carrying capacity limitations, however, are generally entitled to a presumption of validity. This is contrasted with the use of adjudicative permits to assess assimilative capacity thresholds. While adjudicative permits allow for aggressive review of development in relation to cumulative impacts, their ad hoc nature demands precise application by local governments.

INTRODUCTION

This article suggests that local governments use a “cumulative impact”\(^1\) or “carrying capacity”\(^2\) analysis as a tool to assess the impact

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1 Cumulative impact can be defined as the impacts on a built or natural system which result from the incremental impacts of past, present and foreseeable future actions.

2 See generally Devon Schnieder et al., The Carrying Capacity Concept as a Planning Tool (1978). Carrying or assimilative capacity is defined as: (1) the maximum population density for a given species in an environment which could be supported without significant environmental degradation; and, (2) the ability of a natural or man-made system to absorb population growth or physical development without significant degradation. See id. at 1.
of plans, policies and regulations upon built and natural resources. A carrying capacity analysis assesses the ability of a built resource (such

3 This article presumes that there is an assimilative capacity to every natural and built resource. Although built resource capacities can be expanded and improved, natural resource limitations are finite. This presumption was the focus of an interesting colloquy between Jane Jacobs and the author wherein Ms. Jacobs responded that carrying capacity approaches are “too simplistic” and that the use of regulatory tools to manage growth has been applied throughout the years in a “simple-minded” and overly restrictive fashion. Jane Jacobs, Address at the Boston College Environmental Affairs Law Review Symposium, Jane Jacobs and the New Urban Ecology (Nov. 18, 2000). The theme that government is both inflexible and often uncreative in its application of landuse controls is found in Jane Jacobs’s The Death and Life of Great American Cities. See generally JANE JACOBS, THE DEATH AND LIFE OF GREAT AMERICAN CITIES (1961) [hereinafter JACOBS, DEATH AND LIFE]. In fact, the opening sentence of The Death and Life of Great American Cities states that “[t]his book is an attack on current city planning and rebuilding.” Id. at 1. The same critique is found in Ms. Jacobs’s more recent Systems of Survival. See generally JANE JACOBS, SYSTEMS OF SURVIVAL (1992) [hereinafter JACOBS, SYSTEMS OF SURVIVAL]. In Systems of Survival, Ms. Jacobs characterizes society as consisting of two moral halves, the “guardian” and the “commercial.” Id. at 51. The “guardian” half—the government—is conservative, shuns trading, is obedient, and adheres to tradition. Id. at 58. The “commercial” side—the private sector—is the opposite; it is optimistic, efficient, industrious and uses initiative and enterprise. Id. at 33–38. Ms. Jacobs sees it as the role of government to take responsibility for enacting policies into law, while it is the role of the commercial half to take responsibility for developing innovative means and methods of compliance. Id. This belief in “guardian” and “commercial” systems appears to be the basis for Ms. Jacobs’S reaction to the author’s proposal that government restrict new and expanded growth and development to the carrying capacity of the underlying resource. Jane Jacobs, Address at the Boston College Environmental Affairs Law Review Symposium, Jane Jacobs and the New Urban Ecology (Nov. 18, 2000). Under the systems she describes, government could enact a law that proscribes the destruction of a natural resource, but it should not articulate the means or methods by which the resource be preserved or protected. JACOBS, SYSTEMS OF SURVIVAL, supra, at 208. In other words, establishment of policies and regulations is the job of the government. Id. But determining how to comply with adopted regulations should be left up to the innovation of the private sector:

I used to think of government—meaning good government—as the major force at work in the civilizing process. Now I’m inclined to think of government as being essentially barbaric—barbaric in its origins and forever susceptible to barbaric actions and aims. . . . Some other civilizing agent must therefore be necessary. This, I now think, is the guardian-commercial symbiosis that combats force, fraud, and unconscionable greed in commercial life and simultaneously impels guardians to respect private plans, private property and personal rights. . . . So perhaps we have a useful definition of civilization: reasonably workable guardian-commercial syndrome.

Id. at 214. The market alternative approach to landuse regulation was similarly summarized by former professor, and now United States Senator, W. Philip Gramm: “Land use planning, clearly an inefficient system, represents a step backward and not a step forward. We must remember that in another age of government controls and intervention (the age of Mercantilism) economic and social progress was made by reducing market interferences, not by increasing them.” W. Philip Gramm & Robert B. Ekelund, Jr., Land Use Planning:
as roadways, wastewater treatment plants, municipal swimming pools) or natural resource (such as aquifers, surface water bodies, or coastal estuaries) to absorb population growth and related physical development without degradation. Without such an analysis, a system could fail to perform as designed, or, in the case of a natural resource, diminish in health or productivity.


Notwithstanding the private sector's ability to engineer solutions to carrying capacity limitations of built resources, this article contends that such creative and industrious thinking is not relevant to protection of natural systems insofar as carrying capacity thresholds are concerned. While the private sector is clearly capable of engineering nitrogen removing septic systems, it cannot increase the carrying capacity thresholds of the receiving waters denigrated by excessive nitrogen. Thus this article contends that without a carrying capacity approach to resource management, natural and built systems will continue to be programmed by local governments to assimilate development densities which cannot be assimilated, and that once the carrying capacity of a resource is exceeded, it may be difficult if not impossible to remedy.

4 See SCHNIEDER ET AL., supra note 2, at 1.

5 Built resources such as bridges, roads, water distribution systems and wastewater treatment facilities, for example, each have design carrying capacities. See, e.g., STANDARD HANDBOOK FOR CIVIL ENGINEERS (Frederick S. Merritt ed., 3d ed. 1983).

6 It is presumed that all natural resources have a carrying capacity, although the carrying capacity for many natural resources has not been quantified. For example, underlying many federal laws designed to protect wildlife is the assumption that wildlife habitat must be protected to ensure the protection of the species. See, e.g., Northern Spotted Owl v. Lujan, 758 F. Supp. 621, 629 (W.D. Wash. 1991) (holding that the Endangered Species Act required listing of Northern Spotted Owl occur in conjunction with designation of the species' critical habitat).

Drinking water supplies, surface water bodies and coastal water systems have been the subjects of intensive studies relating to carrying capacity thresholds over the past several years. For example, Congress acknowledged the carrying capacity of drinking water supplies in the 1986 Amendments to the Safe Drinking Water Act and the carrying capacity of surface and coastal waters in the Clean Water Act (CWA), first adopted in 1972. Safe Drinking Water Act Amendments of 1986, 42 U.S.C. § 300f (1994); CWA, 33 U.S.C. § 1313 (1994). Section 303(d) of the CWA requires states to develop a list of waters not meeting water quality standards or waters that have impaired uses. CWA, 33 U.S.C. § 1313(d). Listed water bodies must be prioritized and a management strategy or total maximum daily load (TMDL) must be developed for all listed waters. Id. § 1313(d)(3). A TMDL is the sum of pollutants a water resource can assimilate and still meet articulated water quality standards for specific uses, including drinking water, recreation and marine life. See, e.g., Natural Res. Def. Council v. Fox, 909 F. Supp. 153, 156 (S.D.N.Y. 1995); Alaska Ctr. for the Env't v. Browner, 20 F.3d 981, 983 (9th Cir. 1994); Hearings before the House Subcomm. on Oversight, Investigations and Emergency Mgmt. Comm. on Transp. and Infrastructure, 106th Cong. (July 27, 2000) (testimony of J. Charles Fox, Assistant Adm’r for Water, EPA); Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water
Understanding the carrying capacity or constraints of these resources can be an effective method for identifying the areas of the community that are suitable for new or expanded development. The converse proposition is also true: when the carrying capacity of a resource is identified, a local government can revise its plans, policies and regulations to ensure that carrying capacities are not exceeded. Simply put, when municipal residents and officials have a working understanding of carrying capacity limitations, they have the ability to make more rational and defensible decisions regarding the location and density of development.\(^7\)

However, determining the carrying capacity of a built or natural resource entails a rigorous quantitative analysis.\(^8\) Municipalities and local government agencies may avoid this analysis because they believe it requires scientific investigations beyond their financial or technical abilities.\(^9\) Nevertheless, by completing a carrying capacity analysis, the government, and local governments in particular, gain a powerful and legally defensible tool with which to make decisions.\(^10\)

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\(^7\) In his famous work, *The City of To-morrow and its Planning*, Le Corbusier criticized the cities of Europe for their poor design, inadequate infrastructure and absence of planning logic as unable to support the growing population, a growth that would only be possible by rebuilding the infrastructure and the urban center. *See generally Le Corbusier, The City of To-morrow and its Planning* (Frederick Etchells trans., 1929) (1926). Le Corbusier also noted, however, that the lack of adequate infrastructure was only half of the problem: the other half, as discussed in this article, is that built systems have a tolerance level that renders the system inoperable or unsafe when it is exceeded. *See id.* at 112. This tolerance level is exceeded by land development and its coincident population growth. *See id.*

\(^8\) See, e.g., Robert Howarth et al., *Some Approaches for Assessing Human Influences on Fluxes of Nitrogen and Organic Carbon to Estuaries*, in *Estuarine Sci.* 17 (John E. Hobbie ed., 2000); Gordon E. Beanlands, *Cumulative Effects and Sustainable Development* (1992) (paper presented at the United National University International Conference on Definition and Measurement of Sustainability: The Biophysical Foundations) (stating that "our intuitive understanding of the [carrying capacity] concept ... is much more advanced than our ability to apply that knowledge in a meaningful and practical manner").

\(^9\) Local governments face an additional dilemma concerning the degree of certainty of the science or engineering upon which the regulation is based. While "more" science is generally better than "less," local governments should still adopt carrying capacity regulations even though the science is incomplete because courts may well defer to the expertise of the local governmental experts. *See, e.g., State of Louisiana v. Verity*, 853 F.2d 322, 329 (5th Cir. 1988).

Further, this analysis may also help local governments to resolve conflicts between competing development and preservation goals.\textsuperscript{11}

Whereas previous commentary on this issue has supported carrying capacity approaches to limit or slow municipal growth,\textsuperscript{12} questioned the substantive basis for use of carrying capacity analysis,\textsuperscript{13} or discussed only the analytical approaches to carrying capacity,\textsuperscript{14} this

\textbf{“Development” is part of the concept of sustainable development. Most environmentalists do not propose rolling society back to the natural conditions of the frontier. But human actions that cause continuing net losses overall, deplete critical resource bases, or foreclose other future necessities, are a short-sighted endgame that long has been the target of environmental law’s protective efforts.}

\textit{Id.}

\textsuperscript{11} See id.

\textsuperscript{12} See Tom Pierce, Comment, A Constitutionally Valid Justification for the Enactment of No-Growth Ordinances: Integrating Concepts of Population Stabilization and Sustainability, 19 U. HAW. L. REV. 93, 113 (1997). In this work, the author cites two Florida cases. In the first, the City of Boca Raton attempted to limit growth based on water supply and other infrastructure limitations; in the second, the City of Hollywood attempted to limit growth to a fixed number of dwelling units. See generally City of Hollywood v. Hollywood, Inc., 432 So. 2d 1332 (Fla. App. 1983); City of Boca Raton v. Boca Villas Corp., 371 So. 2d 154 (Fla. 1979). City of Boca Raton was overturned, while City of Hollywood was sustained on appeal. The court in City of Hollywood distinguished the two cases in large part due to the extensive analytical work prepared by the City of Hollywood prior to adoption of the challenged ordinance. Specifically, the court noted that in City of Boca Raton, the growth cap was established by public referendum, the City planning department was never even consulted and the Boca Raton Planning Director knew of no compelling reason for imposing the fixed limitation. See 432 So. 2d at 1335. However, Hollywood “did not adopt any such Alice-in-Wonderland approach. The record is replete with comprehensive plans, studies, reports, public meetings and actual discussions . . . .” Id.


\textsuperscript{14} Articles and texts on the subject of carrying capacity typically present only a methodology for establishing carrying capacity formulas. The link to an effective regulatory program is generally absent. The Marine Law Institute of the University of Maine Law School has prepared a comprehensive bibliography on cumulative impact and carrying capacity studies for the U.S. Department of Commerce and the National Oceanic and Atmospheric Administration. \textit{See generally UNIVERSITY OF MAINE LAW SCHOOL, MARINE LAW INSTITUTE, METHODOLOGIES AND MECHANISMS FOR MANAGEMENT OF CUMULATIVE . . . .}
article discusses carrying capacity in a different light: as a way to assess the impact of plans, policies and regulations upon built or natural resources. Local governments have the ability to apply regulatory controls to land development and avoid exceeding the assimilative capacity of a built or natural resource. Further, the tool for ensuring that these carrying capacity controls are effective is the local government’s comprehensive plan.

I. ANALYZING AND ASSESSING CUMULATIVE IMPACTS AND CARRYING CAPACITY

We ought to look at densities in much the same way we look at calories and vitamins. Right amounts are right amounts because of how they perform. And what is right differs in specific instances.15

It is important to remember that all built and natural resources have a carrying capacity.16 When that capacity is exceeded, the resource fails to function as intended or hoped. For example, residents of every major metropolitan region in the nation have experienced carrying capacity failures on freeways leading into and out of these cities.17 Similarly, most residents of urban areas have experienced carrying capacity excesses on mass transit systems, public beaches, and


15 Jacobs, Death and Life, supra note 3, at 209.
16 Numerous commentators have written extensively on the fact that natural systems are not inexhaustible and that few natural resources can withstand indefinite impacts without undergoing fundamental change. See generally Scientific America, Inc., Managing Planet Earth: Readings from Scientific America Magazine (1989); Lloyd Timberlake, Only One Earth (1987); The World Commission on Environment and Development, Our Common Future (1987). Contrary opinions are plentiful. See Richard Pipes, Property and Freedom 250-51 (1999) (blaming "environmental hysteria" as a powerful and emotional rationale for the encroachment on property rights and analogizing the situation to the doomsday scenarios proffered during the Cold War).
17 Carrying capacity analyses for road and highway systems is accomplished through an alphabetic (A to F) rating system entitled "level of service." See Michael R. Lindeburg, Civil Engineering Reference Manual 16-8 (4th ed. 1986). Level of service is defined as a qualitative measure describing operational conditions within a traffic stream and perceptions by motorists as to mobility and safety. Id. A level of service definition provides a determination as to quality of traffic flow in terms of factors such as speed, freedom to maneuver, comfort, safety and travel time. Id. Six levels of service are defined for each roadway, with level of service "A" defined as little or no delay, and level of service "F" indicating significant delays with volume exceeding roadway capacity. See id.
recreational facilities. These systems fail when they simply cannot accommodate the number of residents seeking to use them at the same time.

Solutions to carrying capacity failures for built resources are plentiful. In the examples noted above, a city could solve these problems by building additional roadways, putting additional trains into service, or expanding recreational facilities. There may be financial limitations\(^\text{18}\) to improve service or expand facilities, but for the most part, built resources can be rebuilt larger, better, and perhaps more accommodating.

On the other hand, natural resource carrying capacities are not as readily improved. Once their carrying capacity is exceeded, it may be impossible to restore.\(^\text{19}\) The sections below focus in particular on water and wetlands to illustrate and explain how it can be difficult to both "fix" and replicate the carrying capacity of natural resources while still accommodating development.

\(^{18}\) Many jurisdictions have "resolved" the financial constraints affecting improvements to built resources through the use of "impact fees" and "linkage" programs. For a further discussion on impact fees and their relationship to carrying capacity programs, see infra n.97 and accompanying text.

\(^{19}\) Several commentators have proposed a "risk-based" taxation policy for developments that pose public health threats due to development in areas vulnerable to coastal storms, earthquakes and other natural disasters. See, e.g., Robert Deyle & Richard Smith, Risk-Based Taxation of Hazardous Land Development, 66 J. AM. PLANNING ASS'N 421, 422 (2000). In exchange for development within these locations, public subsidies should be eliminated and the developer should assume the payment of a user fee or separate tax to compensate the local government for the public costs of providing emergency management services necessitated by the development's location. See id.

While I concur that public subsidies for development in known risk areas should be discontinued, I strongly disagree with the option of developing-yet-paying-for-the-risk (destruction). It is raised here only to deflect its possible application to the current topic. The concept of allowing hazardous development if the development adequately compensates local government for the associated risk ignores the principles of carrying capacity limitations and threats to public health and safety. Such a process leads to the possibility that land developers could "purchase" natural or built resource damages. For example, a carrying capacity analysis has determined that 35 dwelling units can be constructed within the watershed of a small surface water body without exceeding the water body's capacity for phosphorus loading. Translated into zoning regulations, a developer within the watershed would be allowed to develop no more than 35 dwelling units. Under the "risk-based" approach, however, the developer could simply purchase the carrying capacity exceedance. In the alternative, and although the result is the same, the developer could pay a higher tax, a user fee or special assessment to compensate the local government for the exceedance.
A. Drinking Water

Water used for human consumption has a health-related carrying capacity, as consumption in excess of this capacity poses a public health risk. Unlike roads, bridges, or schools, once the carrying capacity of a water supply has been reached, it can no longer be “fixed.” For example, EPA has set the carrying capacity for nitrogen in drinking water at ten parts per million (ppm).20 Once a drinking water supply has exceeded its capacity for nitrogen, the supply no longer meets federal and state health regulations and no longer constitutes potable water. At issue is the “fix.”

Without reducing the sources of nitrogen themselves, there is no existing way to remedy the increased nitrogen levels. In other words, the water at the well cannot be effectively treated to remove nitrogen.21 Thus, the only effective means of re-establishing the potability of well water is to reduce nitrogen levels over time by slowing or ceas-

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20 A maximum contaminant level (MCL) for nitrate, as “N,” in drinking water supplies was established at 10 mg/l by the Public Health Service in 1962 and subsequently adopted by EPA under the Safe Drinking Water Act of 1986. See Safe Drinking Water Act Amendments of 1986, 42 U.S.C. § 300h (1994). Nitrate, when ingested, can cause the potentially fatal condition of methemoglobinemia (also known as blue baby syndrome) in infants under six to eight months. R. Rajagopal & Graham Tobin, Expert Opinion and Ground Water Quality Protection: the Case of Nitrate in Drinking Water, 27 GROUND WATER 835, 838-47 (1989). In addition, studies have suggested that nitrate in drinking water could react with certain compounds in foods to form nitrosamines, a cancer-causing agent. See id. At least one study has determined a positive correlation between nitrate in ground water supplies and birth defects where the water supply had more than 10 mg/l nitrate. See Margaret M. Dorsch et al., Congenital Malformations and Maternal Drinking Water Supply in Rural South Australia: A Case Control Study, 119 AM. J. EPIDEMIOLOGY 473, 477-79 (1984).

21 The difficulty of removing nitrogen lies in the fact that nitrogen dissolves in ground water; it does not float on or sink in ground water. See Sanjay Jeer et al., Nonpoint Source Pollution: A Handbook for Local Governments 47 (1997) [hereinafter Nonpoint Source Pollution]. Thus excessive nitrogen loading to the ground water through non-point sources such as septic systems, agricultural runoff or a host of other diffuse contributors removes practical options for “capturing” the contaminant. See Rajagopal & Tobin, supra note 20, at 837-38. This fact compares with removal of “floaters” and “sinkers,” contaminants that due to their solubility in water, either float on the water table or sink through an aquifer until they encounter an impermeable layer (e.g. bedrock or clay). By virtue of their relatively contained status and the fact that most “floaters” and “sinkers” are from point sources, these contaminants can generally be remediated. See Nonpoint Source Pollution, supra note 21, at 41-53. Although expensive, so-called “pump and treat” technology exists and allows the pumping of contaminated ground water to the land surface for treatment. See Robert M. Cohen et al., EPA Ground Water Issue Paper, PUB. NO. EPA/540/5-97/504, DESIGN GUIDELINES FOR CONVENTIONAL PUMP-AND-TREAT SYSTEMS 19-21 (1997).
ing nitrogen inputs to groundwater. Ironically, this requirement could have been avoided simply by limiting nitrogen inputs to the carrying capacity of the well in the first place.

B. Coastal Waters

The ability of coastal waters to assimilate nutrients such as nitrogen and phosphorus has been the subject of intense research. While little doubt remains that coastal systems have carrying capacities, an oft-debated issue is whether the coastal waters of different regions have the same carrying capacity. Given their variations in water temperature, flushing, salinity and depth, coastal water bodies are believed to have unique carrying capacities that do not lend themselves to generalities.

Nevertheless, when the carrying capacities of individual water bodies can be determined, the imposition of regulations can ensure that the capacity will not be exceeded. As in the case of potable drinking water, preventing the carrying capacity from being exceeded requires virtually the same effort as the necessary “fix” required after the carrying capacity has been reached.

C. Wetlands

Wetlands “replication,” the art and science of creating new or expanded wetlands habitat as a quid pro quo for permission to fill an

23 For example, in nitrogen-limited coastal systems, excessive nitrogen loadings increase the growth of aquatic plants, which leads to diminished water clarity, loss of shellfish habitat, depressed dissolved oxygen levels, build up of bottom sediments and fish kills. Long-term exposure of certain coastal waters to excessive nitrogen levels alters the ecosystem, causing indigenous species to be replaced with an overpopulation of nuisance species, a process commonly referred to as eutrophication. See I. Valiela & J.M. Teal, The Nitrogen Budget of a Salt Marsh Ecosystem, 780 NATURE 652, 652–56 (1979).
24 Thus a shallow coastal embayment such as the Chesapeake Bay (e.g., average depths are under 20 feet) may have a carrying capacity of 100 grams of nitrogen per cubic meter while Santa Monica Bay, given its deep water characteristics (e.g., average depths over 100 feet), is likely to have a carrying capacity of 260 grams of nitrogen per cubic meter. See U.S. EPA, OFFICE OF WETLANDS, OCEANS & WATERSHEDS, TOOLS FOR COASTAL WATERSHED PROTECTION 4–1, 4–70 to 4–71 (1998).
existing wetland, is a tool for protecting wetlands while simultaneously allowing development.25

At first glance, wetlands replication appears to challenge the proposition that all resources have a carrying capacity. By "re-creating" a resource at the site of development or even at a different locus, it can seem as though the resource has not truly been lost. However, replication and re-creation of a natural resource, even where feasible, does not diminish the importance of understanding carrying capacity thresholds. For example, a land developer seeking to comply with municipal subdivision regulations that require two means of egress from her development may propose to fill several acres of wetlands and replicate the wetland elsewhere on her property. While the proposal clearly complies with the "no net loss" policy for wetland protection,26 replicating the resource should also require the developer to apply carrying capacity principles. For example, she should consider where the replication will occur, the impacts on surrounding land uses, the newly-created resource's threshold for nitrogen, phosphorus, metals and other contaminants, and the newly-created resource's potential for survival in the proposed location.27

Wetlands replication assumes that one portion of a resource or region has a greater carrying capacity than another.28 This determination cannot occur, however, until the carrying capacity of each affected built or natural resource has been established.


27 A 1989 study prepared by the U.S. Army Corps of Engineers and a 1998 study by the University of Massachusetts analyzed the success of wetland mitigation and replication projects. See generally Brown & Veneman, supra note 25; U.S. Army Corps of Engineers, supra note 25. The findings of both studies demonstrate that replication does not always work and the values of the original wetland resource, such as plant community diversity and wildlife habitat, were generally not replicated. Id.

II. THE COMPREHENSIVE PLAN AND CARRYING CAPACITY

Land use planning and the evolving body of American land use law originates from the notion that cities, towns, and regions must look at the “big picture” to plan adequately for the future. This “big picture” thinking is perceived as visionary and holistic, leading many states to require municipalities to prepare so-called comprehensive, master, or general plans. Typically, a municipality must prepare a plan before it may adopt zoning, subdivision control, or health regulations.

States requiring plans prescribe a process and list of ingredients, or elements, for preparing a comprehensive plan, such as planning for transportation facilities, natural resource management, and affordable housing. A second set of states does not require its member local governments to prepare a plan as a precondition for land use regulation. These “non-plan” states place their municipalities in a precarious position when local regulations are challenged, because the regulations are arguably arbitrary if not developed in accordance with some plan. These two models are discussed in the sections that follow.

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31 See Jon Witten, Commentary and Critical and Sensitive Areas Element, in AMERICAN PLANNING ASS’N, GROWING SMART: LEGISLATIVE GUIDEBOOK 7–134 to 7–141 (1999). However, plan states generally do not require local governments to assess the relative importance of each plan element:

While the relative ranking of each element is difficult, it is important. It is difficult because it requires a subjective ranking of one resource’s value over another’s. The relative ranking is important as it allows local governments to focus on priority protection areas. For communities that deem all their resources of equal value or all their needs of equal importance, the resulting analysis should state so. Otherwise, the community should attempt to prioritize where possible.

See id. at 7–135.

32 See Mandelker, supra note 30, at 86, 87.

33 Professor Charles M. Haar has made clear the importance of linking planning to regulation, a fact that still escapes many jurisdictions:

The legal implications of this theory seem manifest. A city undertaking to exercise the land regulatory powers granted to it by state enabling legislation should be required initially to formulate a master plan, upon which the regu-
A. Carrying Capacity and the Comprehensive Plan in Plan States

In addition to the elements traditionally found in the comprehensive plan, the plan should also contain an analysis of the carrying capacity of the jurisdiction’s built and natural resources. Such an analysis should identify and quantify the ability of each resource to withstand the impact of an additional dwelling, retail structure, wastewater treatment plant and so on. The true benefit of the comprehensive plan can be realized only by completing such an analysis.\(^3^4\)

For example, plan states require municipalities to prepare a comprehensive plan in accordance with specific criteria and guidelines.\(^3^5\) While the local government generally has broad discretion in expanding the scope of the plan,\(^3^6\) the specific state guidelines are considered to be the mandatory elements of the plan. Yet, while the plan must be both internally and externally consistent,\(^3^7\) states do not


\(^3^4\) See generally id. Without such an analysis, the plan and resultant regulations are vulnerable to attack. This attack would be similar to that in a “non-plan” state: the plan and regulations fail to protect resources from exceeding their assimilative capacity and, therefore, cannot be protective of health, safety or welfare. By definition, the plan and regulations must, therefore, be arbitrary. As Haar states, “... only an ordinance drawn with forethought can be a reasonable ordinance, and only a reasonable ordinance can hurdle the constitutional barriers of due process and equal protection.” Id. at 1171.

\(^3^5\) See, e.g., CAL. GOV’T CODE § 65300 (1997) (requiring cities and towns in California to prepare a general plan consisting of seven mandatory elements); ALASKA STAT. § 29.40 (2000) (requiring municipalities in Alaska to prepare comprehensive plans containing five mandatory elements); R.I. GEN. LAWS § 45-22.2 to 45-22.6 (1999) (requiring local governments in Rhode Island to prepare comprehensive plans containing eight mandatory elements and an implementation plan); ARIZ. REV. STAT. § 9-461.05 (1996) (requiring local governments in Arizona to develop general plans containing nine elements).

\(^3^6\) See CAL. GOV’T CODE § 65303 (1997).

\(^3^7\) Consistency, for these purposes, is often divided into horizontal and vertical consistency. See AMERICAN PLANNING ASS’N, GROWING SMART: LEGISLATIVE GUIDEBOOK 2-1, 2-10 (1999) [hereinafter GROWING SMART]. Horizontal or internal consistency requires that the mandated elements of the plan be consistent with each other. See id. at 2-7. For example, a plan element that calls for open space protection in a portion of the community should not be contradicted by a different element that calls for increased industrial activity at the same locus. Vertical or external consistency requires that all regulatory enactments (e.g. zoning ordinances and subdivision regulations) be in accordance with—consistent with—the plan. See id. at 2-7. Florida provides a specific definition of consistency: “A development approved or undertaken by a local government shall be consistent with the comprehensive plan if the land uses, densities... and other aspects of development are...
impose a carrying capacity requirement. As a result, a comprehensive plan could comply with the state’s planning mandate and consistency requirements, but the effect of incremental or cumulative land use decisions could exceed the assimilative capacity of both the natural resources and built resources.

For example, assume that a city council wishes to designate a portion of the jurisdiction currently zoned for low-density residential use as “light industrial.” Before the zoning ordinance can be amended, the plan must be revised to comport with vertical consistency requirements. Once completed, the city can then ensure horizontal consistency with the plan and land use regulations by rezoning the specific land area light industrial.

To amend the plan and subordinate regulations, the city must determine the impact of the rezoning from residential to light industrial and prove consistency with each required element of the plan. The legislative body can adopt the new zoning designation only after such a determination. However, this otherwise logical process has omitted an important consideration.

While making the vertical and horizontal consistency findings, the city never analyzed the cumulative impact of this plan and regulation change under future build-out conditions and never recognized carrying capacity thresholds. The city was required to assess the impacts of the plan change and rezoning on infrastructure, water resources, housing, and open space, for example. But, the alteration was compatible with and further the objectives, policies, land uses and densities or intensities in the comprehensive plan.” FLA. STAT. ANN. § 163.3194(3)(b) (2000). Tennessee’s is more general: after the approval of the growth plan, all landuse decisions made by a city or county must be consistent with the provisions of the growth plan. TENN. CODE ANN. §§ 6-58-101, 6-58-107 (1998).

38 A municipality’s build-out refers to a quantitative evaluation of the total number of residential dwellings and non-residential square footage that is possible given the jurisdiction’s land use regulations, most notably, zoning. As a build-out assumes that landowners will maximize their development potential, it generally reflects a development density in excess of historical densities. A build-out should be distinguished from a more analytically derived population estimate for the jurisdiction or a sub-region within a municipality. See Steve Murdock et al., Evaluating Small-Area Population Projections, 57 J. AM. PLANNING ASS’N 432 (1991); see also Gerrit Knaap & Terry Moore, Land Supply and Infrastructure Capacity: Monitoring for Smart Urban Growth, (Lincoln Institute of Land Policy: Working Paper, 2000) (discussing the potential ways in which urban growth can be measured to gain a better understanding of urban growth processes and growth management policy) (copy on file with author).
never subjected to a more specific, assimilative capacity test for each element.

Thus, even plan states need to require more from their local governments. Municipalities should articulate definitive statements which enumerate specific goals and policies within their plans. These specific goals and policies should ensure that carrying capacity thresholds will be respected. The relevant legislative and adjudicative bodies can then translate these credible plan goals into enforceable regulations.

B. Carrying Capacity in Non-Plan States

Local governments in non-plan states are not required to establish a plan before adopting land use regulatory controls. As a result, land use regulations such as zoning and subdivision control do not require consistency with each other or with other regulatory actions such as wetland protection, health codes, or historic and aesthetic regulations.39

For example, suppose a local government in a non-plan state adopts a zoning ordinance allowing development densities such that the carrying capacity of a surface water body relative to nutrients will soon be exceeded. At the same time, it adopts a wetland protection regulation that prohibits disturbance of the wetland habitat within 100 feet of the surface water body. These two regulations are vertically and horizontally inconsistent and will inevitably lead to unintended results. The zoning ordinance ignores the cumulative effect of development on the water resource. In contrast, the wetland regulation seeks to protect wetland habitat but conflicts with the zoning ordinance and will do little except establish a 100-foot buffer around an otherwise lifeless water body. This simple conflict could be avoided if the local government had a comprehensive plan and development was consistent with that plan.40

39 See generally Rando v. Town of N. Attelborough, 692 N.E.2d 544, 550 (Mass. App. Ct. 1998). The court, in finding that the rezoning was not void, held that "[n]either the master plan nor the law requires that zoning be in strict accordance with a master plan." Id.

40 Philip R. Berke & Maria Manta Conroy, Are We Planning for Sustainable Development?, 66 J. AM. PLANNING ASS'N 21, 31 (2000). In a detailed analysis of 30 municipal comprehensive plans, Berke and Conroy concluded that the preparation and adoption of a comprehensive plan, as mandated by the state, furthered efforts toward ensuring "sustainability" and management of natural resources:
Perhaps the greatest conflict emerging in all states, but which is magnified in non-plan states, is between the need for affordable housing and the generalized goals of environmental resource protection.41 The shortage of affordable housing for low- and medium-income families has provided the backdrop for a series of recent studies throughout the nation, some aimed at identifying the barriers to affordable housing development.42 One conclusion of these studies is that local regulatory controls, such as zoning, subdivision control, and health-related regulations, are used intentionally as roadblocks in the path of affordable housing development.43 While the issue of affordable housing is beyond the scope of this article, it does highlight an important and related point: without a plan upon which to base regulations, debates over local government priorities become hopelessly confused.

Clearly most urbanized states have affordable housing crises. But they also have crises of wetland loss, open space depletion, and water quality contamination. Their road systems and transportation networks are overtaxed and antiquated. At issue is establishing priorities for subsequent action: without a plan, how do the respective state legislatures or, more importantly, the local government legislatures, prioritize housing over roads, or road development over wetlands protection? In the absence of a plan, how can any priority be anything but arbitrary? The simple answer is that without a plan, the resulting government actions are arbitrary and, if challenged, should fail.

Prior research suggests that the presence of state planning mandates has a strong influence on the content and quality of local plans. . . . State mandates could thus help local governments to go beyond the rhetoric of sustainable development by requiring local adoption of plan policies that promote balanced and mutually reinforcing sustainable development principles.

Id.

41 See Growing Smart, supra note 37, at 4–64 (citing the U.S. Advisory Commission on Regulatory Barriers to Affordable Housing, Report to the President, Not in My Back Yard: Removing Barriers to Affordable Housing 7–12–13 (1991) [hereinafter Not in My Backyard]).

42 See, e.g., Commonwealth of Massachusetts: Executive Office for Admin. and Fin., Bringing Down the Barriers: Changing Housing Supply Dynamics in Massachusetts 24 (2000) [hereinafter Bringing Down the Barriers]; Growing Smart, supra note 37, at 4–64 (citing Not in My Back Yard, supra note 41, at 7–12–13).

The ongoing problems in many states point out the hypocrisy of landuse action in the absence of a plan and planning requirements. Housing advocates argue that local governments use regulatory tools to impede the progress of affordable housing, pointing to large lot zoning and strict subdivision regulations as examples of how local governments are adding too much cost to housing development. Yet large lot zoning and subdivision rules and regulations stem from the premise that local governments are empowered to protect the health, safety, and welfare of their residents. A hopelessly circuitous "Catch-22" results: cities and towns are not required to plan as a precondition to adopting land use regulations, but adopted regulations are attacked as being excessive.

The challenge non-plan states face is how to establish priorities for subsequent action: housing instead of roads or road development instead of wetlands protection. The best way to understand these challenges is to compare the effect of similar statutes on a plan state and a non-plan state. Massachusetts, a non-plan state, adopted the Anti-Snob Zoning Act as a means of increasing affordable housing, particularly in the state's suburbs. In practice, the Act requires municipalities to grant a waiver from any and all locally-based regulations in favor of the development of "affordable housing," regardless of the regulation's purpose or intent, if the city or town does not have at least ten percent of its housing stock subsidized by a federal or state

44 See Growing Smart, supra note 37, at 4-64 (citing Not in My Back Yard, supra note 41, at 7-12-13 (1991)).

45 Perhaps the greatest controversy is whether local land use regulations, even aggressive land use regulations, impact the cost and supply of housing. "Restrictive local policies not only reduce the amount of land available for development and decrease the number of units that can be built on undeveloped land, but they can also exacerbate the economic stratification of communities." Bringing Down the Barriers, supra note 42, at 24. An exhaustive survey of 25 metropolitan regions of the country found, however, that regulations designed to manage growth and protect resources have little, if any, impact on the supply or cost of housing. See Pendall, supra note 43, at 138.

According to this study, permit caps and growth boundaries, often modeled as supply constraints that will inexorably elevate housing prices, did not consistently reduce housing growth in the 1980s. Neither did they have any consistent average effect on housing unit types, tenure, or affordability... In short, permit caps and growth boundaries sometimes have exclusionary effects, but often they are little more than symbols of concern about the pace and shape of new growth.

Id.

subsidy program. This requirement, however, conflicts with the readily definable carrying capacity of the region’s water resources for nitrogen and phosphorus. Yet, under the Act, an application for affordable housing development that would result in the generation of nutrient levels beyond the carrying capacity of the water resource would nevertheless be entitled to approval. The need for affordable housing has trumped environmental protection, even though there has been no analysis of the impact this sweeping initiative will have upon the state’s environmental resources. Perhaps the greatest indictment against the Massachusetts approach and the approaches of other non-plan states, however, is that by eschewing planning and substituting priorities of political whim, they retard and distort a vision of the future. Ultimately, local residents will lose their voices to their futures when they are lulled with false promises of home rule and self-determination, which are largely irrelevant if local plans and visions are not taken into account.

The example provided by Massachusetts stands in sharp contrast with the approach taken in Rhode Island. Rhode Island has a similar statute to Massachusetts’ Anti-Snob Zoning Act, mandating that local governments have at least ten percent of their housing stock set aside as subsidized for affordability. As a plan state, Rhode Island’s Comprehensive Planning and Land Use Regulation Act requires that all local governments prepare and adopt a comprehensive plan, including provisions for housing. Local governments in Massachusetts and Rhode Island that do not have the mandated affordability percentages are vulnerable to an appeal to the State Housing Appeals Committee and Housing Appeals Board, respectively, according to provisions of the Low and Moderate Income Housing Act. That is where the similarities end, however, since local governments in Rhode Island are required to adopt a comprehensive plan, they are thereby enabled to devise the most logical means of providing for affordability consis-

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47 Id.
48 See discussion, supra Part I (discussing how nitrogen and phosphorus are generated and transported by certain aspects of land development, including wastewater disposal systems, stormwater runoff, landscaping, and lawn fertilization).
tent with their ability to protect natural and built resources from carrying capacity excess. In contrast, Massachusetts' mandate for affordability is linked by neither policy nor statute to the other needs of the community.

The conflict stems from an absence of planning goals. Without a plan, the issue *du jour* makes the headlines and becomes the priority for the moment. The problem, of course, is that this type of knee-jerk action leads to the exact consequences discussed in this article. For example, assume that the housing advocates' argument is correct: local regulations are largely responsible for the housing crisis in many states. Which regulations should be relaxed? Which regulations should local governments be barred from enforcing? What will be the consequences on all relevant local and state concerns *other than* affordable housing? The failure of some states to require plans as a precondition of regulatory control creates the situation discussed above and prevents governments from acting prudently given the broad responsibilities modern governments have. Moreover, carrying capacities of built and natural resources will forever be at risk when certain government policies trump all others. In the example presented, the need for affordable housing outweighs environmental protection, even though no analysis has been prepared as to the impact of this sweeping initiative upon the states' environmental resources.

III. CARRYING CAPACITY REGULATIONS AND THE TAKINGS ISSUE

The point at which a land use regulation "goes too far" and thus constitutes a compensable taking, is often debated and is the subject of numerous articles, texts, and weekday planning board and commission hearings across the country. While the subject makes for interesting dialogue, the methodology for assessing when a regulation goes too far, is well accepted.

For the purposes of this article, land use regulations are viewed as consisting of either: (1) legislative pronouncements, such as a zoning

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52 A recent report analyzing the costs to municipalities of unplanned growth and land development was prepared for the State of Rhode Island. Among the report's many conclusions was that suburban sprawl and urban decay are caused by state policies encouraging home ownership outside of metropolitan areas with a coincident decline of urban centers, decline of open space, and destruction of natural habitat. See generally Grow Smart Rhode Island, *The Costs of Suburban Sprawl and Urban Decay in Rhode Island: Executive Summary* (1999).
ordinance establishing minimum lot size for residential development based upon a carrying capacity analysis,\textsuperscript{53} or (2) adjudicative actions, such as a zoning ordinance that allows an adjudicative board, like a board of appeals, to grant discretionary permits based on established carrying capacity formulas.\textsuperscript{54}

\section*{A. Legislative Actions}

The United States Supreme Court succinctly stated the regulatory takings analysis for legislative decisions in \textit{Agins v. City of Tiburon}.\textsuperscript{55} The Court explained that a regulatory taking occurs when the legislation (1) does not advance a legitimate governmental interest or (2) denies the landowner economically viable use of his land.\textsuperscript{56} A regulation adopted in response to a carrying capacity analysis clearly meets the first prong of this test because the analysis upon which the regulation is based indicates that without the regulation, the resource will decline or malfunction.\textsuperscript{57} The second prong of \textit{Agins}, based on the principles set forth in \textit{Penn Central Transportation Co. v. New York City},\textsuperscript{58} is violated only where the landowner is left with no reasonable economic value.\textsuperscript{59} A mere diminution in value has not been held to constitute a regulatory taking.\textsuperscript{60}

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\textsuperscript{53} This article presumes that changes to municipal zoning ordinances are legislative and not adjudicative functions. A majority of states support this presumption. \textit{See, e.g.}, Margolis \textit{v. Dist. Court}, 638 P.2d 297 (Colo. 1981); \textit{but see} Fasano \textit{v. Bd. of County Comm’rs of Washington County}, 507 P.2d 23 (Or. 1973).

\textsuperscript{54} Other municipal landuse actions also require a takings analysis, but that analysis is beyond the scope of this article. For example, physical invasions, eminent domain, and temporary takings can trigger federal and coincident state compensation requirements.

\textsuperscript{55} \textit{Agins}, 447 U.S. 255, 260-61 (1980).

\textsuperscript{56} \textit{See id.}

\textsuperscript{57} \textit{See id. at 260.}


\textsuperscript{60} \textit{Appellants}, focusing on the character and impact of the New York City law, argue that it effects a "taking" because its operation has significantly diminished the value of the Terminal site. Appellants concede that the decisions sustaining other land-use regulations, which, like the New York City law, are reasonably related to the promotion of general welfare, uniformly reject the proposition that diminution in property value, standing alone, can establish a "taking."


\textsuperscript{60} \textit{See, e.g.}, William Haas \& Co. \textit{v. City and County of San Francisco}, 605 F.2d 1117 (9th Cir. 1979) (holding that a city zoning regulation that effectively reduced the plaintiff’s
Given the rule established in *Agins*, public health regulations that reduce real property value should not constitute a regulatory taking.\(^{61}\) For example, a regulation adjusted to comport with a carrying capacity analysis so that it deprives a landowner the densities allowed under previous zoning regulations would not result in the total deprivation of economic value. Carrying capacity regulations, then, are not tantamount to a total economic wipeout because they would presumably allow some level of development.\(^{62}\) Therefore, carrying capacity regulations are not regulatory takings under the second prong of *Agins* because such regulations do not result in a complete diminution of value.\(^{63}\)

Landowners, however, may still challenge carrying capacity regulations with a regulatory takings claim. Assume that a carrying capacity regulation is in place to protect a watershed. Will it be a regulatory taking if a landowner seeks to develop her property within the watershed, but the watershed’s carrying capacity for nutrient loading has been exceeded? In other words, previous applicants have developed the watershed to its capacity and the local government will not grant new permits for development within the watershed. The affected landowner, citing the Supreme Court’s holding in *Lucas v. South Carolina Coastal Council*,\(^{64}\) and *Agins*,\(^{65}\) will claim that the carrying capacity property value from $2 million to less than $100,000 did not constitute a compensable taking).

\(^{61}\) *Agins*, 447 U.S. at 260–62.

\(^{62}\) See id. at 260–62.

\(^{63}\) This conclusion presumes that state laws, as in Texas, do not define a regulatory taking more narrowly than the U.S. Supreme Court. See Texas Gov’t Code § 2007.002(5)(B)(ii) (2000). Under this provision of Texas law, entitled “Governmental Action Affecting Private Property Rights,” a regulatory taking could include a governmental action that reduces the market value of private property by 25% or more. Id. See also Harvey Jacobs, *The Impact of State Property Rights Laws: Those Laws and My Land*, 50 Land Use L. & Zoning Digest, Mar. 1998, at 3.

\(^{64}\) 505 U.S. 1003 (1992). In *Lucas*, the Supreme Court stated a new categorical takings rule: when a landowner is subject to total deprivation of all economically viable use of her land, a taking has occurred regardless of the purpose or effect of the regulation. Id. at 1027–28. Thus, a regulation that was designed to protect public health, but left the landowner with no economic value, would constitute an unconstitutional regulatory taking. See id. Although Justice Scalia narrowed the scope of this categorical takings rule (allowing for some instances where a complete deprivation could be justified without compensation), the Court’s holding in *Lucas* reversed the long held position that in some instances, private property could be regulated without compensation afforded, no matter how aggressive the regulation. See id. Citing cases dating back to *Mugler v. Kansas*, 123 U.S. 623 (1887), Justice Blackmun’s strong dissent cited numerous cases where a landowner’s property value was destroyed, yet no compensation was awarded, because of the general principle that states
regulation eliminates all economically beneficial uses of her land and thus requires compensation.66

Local governments have three possible responses to the landowner’s inevitable challenge. First, the local government can compensate the landowner to acquire and preserve the real property.67 The acquisition and protection of real property in a watershed, wellhead protection area, or other natural resource habitat provides the strongest level of protection available.68 Second, local governments can defend the carrying capacity regulation under the holding in Lucas by demonstrating that the regulation, and thus the development prohibition, is supported by common-law nuisance principles found in state law.69 Third, local governments can defend the regulations by asserting that they do not destroy all economically viable property uses.70

The government’s third possible response is perhaps the most important because it focuses on the flexible carrying capacity of natural resources. Unlike built resources that have relatively exact carrying capacity thresholds, natural systems are far more forgiving. When a bridge or water supply conduit has exceeded its carrying capacity for vehicles or flow, the system either breaks or malfunctions. Such built resources are generally sensitive to only one threat: bridges collapse under too much weight and water supply conduits fail under too much water pressure or flow.

Natural resources, however, are more flexible because the limit to carrying capacity depends on the use and location of the resource.71 For example, phosphorus limits fresh water bodies but not coastal es-

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65 See Agins, 447 U.S. at 260–61.
67 See Lucas, 505 U.S. at 1027 (requiring compensation for taking of land).
68 SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS, PERMANENTLY PROTECTING WATER SUPPLY LANDS WITH CONSERVATION EASEMENTS 3 (1997). “The most secure means of protecting drinking water is to acquire the land or controlling interests in the land at the source.” Id.
69 See Lucas, 505 U.S. at 1028. This option is the least desirable given the Court’s requirement that support for use prohibition under a common law nuisance theory “must inhere in the title itself, in the restrictions already placed upon land ownership.” Id.
70 See Lucas, 505 U.S. at 1025–27.
71 See NONPOINT SOURCE POLLUTION, supra note 21, at 46–53.
turies. Nitrogen limits coastal estuaries, but not fresh water. Finally, nitrogen, but not phosphorus, threatens drinking water supplies.72

Given the flexibility of natural resources, a carrying capacity regulation limiting development within the watershed of a fresh water body need not stipulate that no development is allowed and thus run afoul of Agins and Lucas.73 Rather, the regulation should be tailored to prohibit additional phosphorus loadings within the watershed. The landowner could then propose land uses that do not generate additional phosphorus. Such a carrying capacity regulation would curtail the landowner’s development options, but it is unlikely that the regulation would eliminate all options. Moreover, carrying capacity regulations that are targeted to specific threats should benefit from the highly deferential judicial review given to legislative actions.74

Unfortunately, legislative actions are imprecise in their ability to protect complex natural resources from the negative impacts of development. Legislative action, based on the findings of a comprehensive plan, can ensure appropriate zoning and land use regulatory controls.75 Site-specific analysis, however, is needed to fine-tune regulations protecting a water body or wetland resource from development impacts. Conditional use and special permits provide this fine tuning through ad hoc and site-specific analysis.76

This illustrates one of the greatest challenges faced by local governments in their protection of natural resources from carrying capacity thresholds. Legislative actions are presumed valid and courts

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74 See, e.g., Robinson v. City of Bloomfield Hills, 86 N.W.2d 166, 172 (Mich. 1957):

But many of the cases coming to us involve merely the legislative judgment. They are the peripheral problems (should the line be drawn here or there?) and the allegations of more advantageous use, with its corollary of “confiscation” (the property is worth more if devoted to some other use). Save in the most extreme instances, involving clearly whimsical action, we will not disturb the legislative judgment.

Id.
76 See generally id. at § 5.24.
have treated legislative acts with great deference,77 but legislative ac­tions, precisely because they are sweeping and general, are less likely to reflect the particular characteristics or nuances of a natural re­source.

For example, the city council could pass a city-wide carrying ca­pacity regulation that limits nitrogen contributions to groundwater to five parts per million. But this broad action is likely to ignore unique attributes of one portion of the city’s aquifer system or ignore specific land uses within one wellhead protection area versus another. Site­specific issues should not be addressed by sweeping legislative action; they should be resolved through adjudicative proceedings because conditional use and special use permits allow for specific variations in geology or land use proximate to the natural resource.

B. Adjudicative Actions

As discussed above, local governments can use legislative actions to establish appropriate use requirements and minimum lot sizes, but legislative actions are generally too “clumsy” to both protect natural resources and ensure that carrying capacity thresholds are not ex­ceeded.78 Adjudicative permits79 cure this shortcoming because a mu­nicipal board or agency can fine tune a development application to ensure that the carrying capacity of an affected resource will not be exceeded.80

Adjudicative permits must be used with caution and in accor­dance with rules clarified by a recent host of cases. First, permit con­

77 See, e.g., Robinson, 86 N.W.2d at 172.
78 See discussion, supra Part III.A.
80 Adjudicative permits are generally required for uses that the jurisdiction encourages or, at a minimum, will support, but nevertheless requires some level of scrutiny by a mu­nicipal board or commission. This distinguishes an adjudicative permit from a use “by right.” It also distinguishes an adjudicative permit from a variance. Whereas adjudicative permits are obtainable provided that the applicant’s development does not, for example, exceed the carrying capacity of the affected resources, a variance is specifically reserved for uses or structural construction that the zoning ordinance does not allow. See, e.g., JUERGENSMEYER & ROBERTS, supra note 75, §§ 5.14, 5.24.
ditions, known as extractions, must relate to the harm posed by the new or expanded development. A nexus between the permit and the harm has always been an integral piece of substantive due process requirements and was last reaffirmed by the Supreme Court’s decision in *Nollan v. California Coastal Commission*. Under *Nollan*, the permit granting authority must ensure that the permit’s conditions directly relate to the harms posed by the new development to an identified built or natural resource.

Second, the permit conditions must also be proportional to the harm posed by the new or expanded development. As with the nexus requirement, proportionality has been historically based on substantive due process. It received renewed public attention in *Dolan v. City of Tigard* when the Supreme Court required the permit granting authority to ensure that a regulation satisfies the nexus requirement and that a regulation imposes conditions proportional to the likely impacts.

Finally, these tests will always apply when real property is surrendered and may apply when public benefits are required in addition to fee simple (or less than fee simple) dedication of real property. As a conservative recommendation, adjudicative boards should apply the standards developed in *Nollan* and *Dolan* to all extractions under a carrying capacity regulation. For example, if the carrying capacity of a water resource will be exceeded unless the development density of a proposed project is reduced by 15%, the adjudicative body could re-

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82 See id. Referring to the decisions in *Nollan* and *Dolan*, the California Supreme Court noted, “[s]cholarly comment on the two cases is almost unmanageably large.” Ehrlich v. City of Culver City, 12 Cal. 4th 854, 868 (1996). The California Supreme Court then cited seventeen references to the two cases and the issues of nexus and proportionality. Id.
83 See *Nollan*, 488 U.S. at 837.
85 “The Fifth Amendment guarantee ... was designed to bar the Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole ... .” Armstrong v. United States, 364 U.S. 40, 49 (1960).
86 512 U.S. at 394–96.
87 For example, in *Ehrlich* the California Supreme Court held that the nexus and proportionality requirements of *Nollan* and *Dolan* are not limited solely to land and, in the facts presented, apply to monetary exactions. *Ehrlich*, 12 Cal. 4th at 860. Notwithstanding *Ehrlich*, and relying on *Nollan*, *Dolan* and the Supreme Court’s decision in *City of Monterey v. Del Monte Dunes at Monterey, Ltd.*, 526 U.S. 687 (1999) and others (e.g., Eastern Enterprises v. Apfel, 524 U.S. 498 (1998)), case law seems to narrow the limitations of the nexus and proportionality requirements to only real property takings.
88 See *Dolan*, 512 U.S. at 391–92; *Nollan*, 483 U.S. at 837.
quire that the proposed development be reduced by 15% of its housing units without violating the standards in *Nollan* and *Dolan*.

First, the required reduction has a substantive basis, as required by *Nollan*, because the reduction is directly related to the harm posed by the development to the water resource. Second, the 15% reduction mandate is based upon analytical and defensible findings and represents no less than the reduction needed to preserve the resource. Thus, the requirements are proportional to the harm.

Some commentators may argue that the nexus and proportionality requirements do not apply because an extraction is not real property. That argument, however, is risky. It would be safer to analyze the relationship and extent of the extraction to the carrying capacity regulation relative to the harm the community seeks to minimize, rather than focusing on whether the extraction was land, money, or off-site improvements.

**CONCLUSION**

This article asserts that all built and natural resources have definable carrying capacities beyond which the resource degrades to an unacceptable level. In the case of built resources, the road, treatment plant, or facility fails to function as designed. In the case of natural resources, the environmental system exhibits substantially adverse effects from human activities.

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89 *See Dolan*, 512 U.S. at 391–92; *Nollan*, 483 U.S. at 837.  
90 *See Nollan*, 483 U.S. at 837.  
91 *See Dolan*, 512 U.S. at 392.  
92 *See*, e.g., *Isla Verde Int’l Holdings v. City of Camas*, 990 P.2d 429, 435 (Wash. Ct. App. 1999), *petition for review granted*, 10 P.3d 1071 (Wash. Sept. 5, 2000). In *Isla Verde Int’l Holdings*, the Washington Appeals Court held that a 30% land dedication imposed regardless of the impact of the new development failed the proportionality test of *Dolan*. *See* 990 P.2d at 435. The court went further, however, stating that the United States Supreme Court’s holding in *City of Monterey v. Del Monte Dunes*, regarding impermissible land takings was “nonbinding dicta” and that the record in the case before it was devoid of evidence of studies or formulas showing a reasonable relationship between the impact of Dove Hill and the 30% set-aside requirement. *Isla Verde Int’l Holdings*, 990 P.2d at 436–37; *see also City of Monterey v. Del Monte Dunes of Monterey, Ltd.*, 526 U.S. 687 (1999).  
94 Admitting that all resources have definable capacities is also an admission that resources, built or natural, impose certain limits on *economic* growth. Although well beyond the scope of this article, it is worth inquiring as to the commonly held perspective on the limits to growth. “Everybody is in favour of sustainability. But (almost) everyone at the same time remains committed to an understanding of the economy-environment interface.
Local governments have the ability to ensure that their built and natural systems do not exceed their respective assimilative capacities. A variety of both regulatory and non-regulatory tools are available to municipalities to implement carrying capacity regulations. If properly adopted and applied, these tools will be both legally defensible and extremely valuable in the protection of built and natural resources.

Perhaps the most important characteristic of carrying capacity limitations, however, is that they reflect the admission by local government residents and officials that their resources have limits. A corollary admission is that once the carrying capacity of certain resources has been exceeded, financial investments may not provide an adequate remedy. The "fix" has come too late and was clearly avoidable. It was avoidable by adhering to a plan for growth, which matched the limitations to growth, in the municipality and region.

that fails to acknowledge limits to growth. As long as that is so, pronouncements on sustainable development will inevitably be little more than rhetoric." Daniel Mittler, Environmental Space and Barriers to Local Sustainability: Evidence from Edinburgh, Scotland, 4 LOCAL ENV'T 363 (1999).

95 Zoning, subdivision control, health, wetlands, and historic district regulations are five examples. Each technique has numerous applications. For example, zoning regulations include overlay districts, transfer of development rights, adjudicative permits, density restrictions, growth and timing controls, and so on.

96 Non-regulatory tools generally include those used to acquire, in fee simple or less than fee simple, development rights to private property. They include outright acquisition of the fee, acquisition of an easement, and lease-purchase arrangements.

97 These financial investments can be municipal (via property taxation, special assessments, bonds, or borrowing) or more recently, via developer paid "impact fee." Impact fees are fees paid by an applicant for development approval for the pro rata "impacts" caused by her new development. Impact fees are extremely popular in several states (e.g. Florida, Hawaii, California, Rhode Island, and Utah) and are often seen as an equitable shifting of the burden of development's impacts onto the private sector. Yet, imposition of impact fees may place unintended obstacles in the path of local government's use of carrying capacity regulations to restrict and guide future growth. The danger lies where local governments, seduced by impact fee collections, forget the importance of requiring ad hoc balancing of new or expanded development against carrying capacity standards.