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ARTICLE

How Possible is Sustainable Urban Development? An Analysis of Planners' Perceptions about New Urbanism, Smart Growth and the Ecological City

EDWARD J. JEPSON, JR. & MARY M. EDWARDS

Abstract

New urbanism, smart growth and the ecological city have been proposed by advocates and others as being the essential equivalent of sustainable development as that term has been broadly defined. This paper focuses on how planners in the USA collectively define these three development approaches in terms of 14 principles of sustainable development. Based on a national survey of practicing planners in the USA, we find that planners everywhere have relatively high, but quite different, expectations regarding what can and should be accomplished under each of the three development approaches. Smart growth is matched most frequently with the sustainable development principles and is also the most understood. The ecological city, while least understood, becomes more frequently matched with the principles as familiarity increases. We conclude with a discussion of the implications of these results for our quest to achieve a more sustainable development pattern.

Introduction

Since 1987, when *Our Common Future* established sustainability and sustainable development as part of the global lexicon (World Commission on Environment and Development [WCED], 1987), writers in the planning profession have grappled with its meaning. Included among the papers in a special issue of the *Journal of Planning Literature* in 1995 were the pioneering conceptual explorations of Rees (1995) and Beatley (1995). Since then, many other planning writers have recognized its potential as a theoretical framework for the practice of planning and the development of communities in the USA (see, for example, Campbell, 1996; McDonald, 1996; Berke & Conroy, 2000; Jepson, 2001; Lindsey, 2003; Portney, 2003; Wheeler, 2004).

While there is substantial agreement about the conceptual meaning of sustainability in ecological and systemic terms, its transference to how it would

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or should work in the human sphere remains problematic (Harris & Goodwin, 2001; Lindsey, 2003). In the opinion of many, the meaning of sustainable development—the practical counterpart to sustainability—remains similarly obscure (Lindsey, 2003; Hanan, 2005). The most well-known definition—'development that meets the needs of the present generation without compromising the ability of future generations to meet their needs' (WCED, 1987, p. 8)—has been widely criticized on a variety of environmental, economic and ethical grounds (see, for example, Daly, 1989; Daly & Cobb, 1989; Broad, 1994; Skirbekk, 1994). However, since no single alternative has emerged to challenge this definition, the discussion and debate continues.

A major challenge in the community development and planning field has been the conversion of sustainable development into actual principles or standards of development practice; that is, its translation 'on the ground', so to speak, into physical human settlements (Godschalk, 2004). Three development approaches have emerged as means to this conversion. One, smart growth, has been presented by the American Planning Association (2002) as a way 'to meet the challenges of *sustainability*'. Another, new urbanism, has been proclaimed by the general media as a guide for development as something that can be '*sustained*' (Hazzard, 2005) and interest in its precepts has been pronounced as being the result of *sustainability* 'becoming an issue' to developers (Sway, 2005). The third development approach, ecological city (or Eco-city), has been presented as a means of 'transformation ... toward greater *sustainability*' (EcoCity Cleveland, 2010); and in China, the planned eco-city of Dongtan in Shanghai was portrayed in 2005 by its developers as 'the world's first *sustainable* city' (ARUP, 2005).

In light of these claims and affiliations, we are interested in discovering how planners in the USA actually view these three approaches. Set at the forefront of their communities' development, planners are in a unique position to influence change when they propose regulations and review projects. If they encounter a project that a developer labels new urbanism, smart growth or ecological city, what do planners expect to see in terms of its development characteristics? How well do these expectations match up with sustainable development and/or with the stated aims of those who advocate these approaches? When planners organize their communities under one of these labels, what sorts of planning policies and regulations might be expected? And to what extent might that vary on the basis of planner characteristics (such as position, education and experience) and community characteristics (such as population and location)?

There has not been extensive inquiry into planners' perceptions about the land-use dimensions of sustainable development. Calavita and Caves (1994) surveyed planners' attitudes about growth, but did not explore their views specifically on sustainability or physical form. Similarly, Jepson's (2003) study focused on planners' opinions about sustainability, but not in terms of its land use characteristics. Garde (2008) reported the results of a survey of California planners, which showed them viewing design as a means to address such sustainability issues as social equity and sense of place. Zeemering's (2009) survey was based on a comprehensive concept of sustainability, which he defined in terms of 36 local initiatives. While four of the initiatives were related to land

use, he did not separate out planner responses from among the 'community and economic development officials' who were surveyed.

In this study, we are specifically concerned about the land-use characteristics of sustainability as these are perceived by planners to be reflected in the development approaches of smart growth, new urbanism, and ecological city. We begin with a review of the literature and the claims of proponents to characterize the nature of each of the three development approaches in relation to sustainable development. This is followed by a systems-based definition of human sustainability that we then use to formulate 14 land development principles. These principles became the basis of a survey that was sent to US planners for the purpose of determining the extent to which the three development approaches are perceived to incorporate the 14 principles. The implications for planning and community development are then discussed.

Three Development Approaches

The three development approaches of smart growth, new urbanism and ecological city have been directly associated with sustainable development. Two of those—smart growth and new urbanism—have become relatively mainstreamed in the USA in terms of both their recognition and their integration into development and planning goals and policies. The ecological city approach, on the other hand, has been less influential in the USA than the other two (Saunders, 1997). However, in other parts of the world, it has received serious attention as an approach for urban development, particularly Europe (UNESCO, 1999; James, 2002), Canada, Australia, and New Zealand (Department of the Environment and Heritage, 2006; Sustainable Niagara, Inc., 2006), and, more recently, Asia (ARUP, 2005; Twist, 2005).

While there continues to be a difference of opinion regarding the principles and components of each of these approaches, broad definitions can nonetheless be derived from the academic literature. Broadly speaking, smart growth can be understood as an attempt to restrain sprawl. This is accomplished through a variety of land-use control and other regional and local policy mechanisms that help encourage more compact development, urban revitalization and re-discovery, transportation and housing diversity, open space protection, and collaborative decision-making. Under smart growth, an expansive economy and population are not viewed as necessarily incompatible with environmental protection (Daniels, 2001; Porter, 2002; Ye *et al.* 2005). The definition of smart growth by its principal US advocate, the Smart Growth Network, is comprehensive, addressing such issues as natural resource protection, expanded housing diversity, regional collaboration, economic development that builds on local capacity and citizen involvement (Smart Growth Network, 2009).

New urbanism is strongly design oriented, representing an 'architecture of community' that is more humanized in scale and character (Godschalk, 2004). With a focus on physical appearance and neighborhood layout to improve quality of life, it calls for more compact, mixed-use development, housing diversity, architecture that is consistent and sensitive to place, common open space abundance (both functional and natural) and internal circulation that is pedestrian

friendly and oriented (Katz, 1994; Diamond & Noonan, 1996; Beatley & Manning, 1997; Wheeler, 2004). New urbanism has a strong interest group in the USA, the Congress for the New Urbanism (CNU, 2009), whose membership includes 'planners, developers, architects, engineers, public officials, investors, and community activists', as well as interested individuals. On its website, the CNU defines new urbanism as seeking 'the restoration of existing urban centers within coherent metropolitan regions' and 'the conservation of natural environments', all achieved through 'citizen-based participatory planning and design'. It specifically claims its equivalence to 'sustainability' (CNU, 2009).

As is the case with new urbanism, the perspective of the ecological cities approach is local, but its area of concern is systemic; that is, it views the community as the product of a collection of interactions that must be kept in balance over time. The aim is to develop communities that do not exceed the limits of nature to sustain them (i.e. carrying capacity). This is accomplished primarily through public policies that encourage the replacement of non-renewable energy and other resources, the protection of open space (particularly in relation to biological and natural processes, assets and services), the use of 'appropriate' technologies, the reduction and natural assimilation of waste, and local economic and functional self-reliance (Platt, 1994, 2004; Kline, 2000; Register, 2002; White, 2002). Ecocity Builders (2010), a principal US-based advocate, defines 'ecocity' in terms of land-use policies that maximize urban density, reduce non-renewable energy consumption, protect biodiversity, reduce travel distances, and maximize transportation options. It also considers ecocity principles as a way to give form and meaning to the concept of sustainability.

Sustainable Development Principles

Since its introduction by the Brundtland Commission in 1987 (WCED, 1987), sustainability as a theoretical basis for human system development has been discussed extensively in and between different fields. In the definition below, we have attempted to merge this discussion into a unified series of statements that connect ecosystem theory with the characteristics of human systems.

> Sustainability is based on the recognition that human systems are—like all natural systems—intrinsically prone to degeneration (i.e. entropy) as a consequence of their consumption of energy (resources) and their emission of waste. Human systems are sustainable to the extent that they are able to organize to match their rates of consumption and emission to the changing regenerative and assimilative capacities of the systems on which they depend and with which they interact. This responsive capacity is directly related to the extent to which individuals and communities—as systemic 'agents'—are (a) able to receive clear and timely signals about environmental conditions, and (b) empowered to organize for an appropriate response to such information. These capacities, in turn, are improved through systemic qualities of diversity (in terms of the contribution of different agents) and complexity (in terms of the number of constructive interactive opportunities between

and among different agents). (Pattee, 1973; Witman, 1985; Giaoutzi, 1990; Mollison, 1990; Jacobs, 1991; Garbarino, 1992; Meadows *et al.*, 1992; Carley & Christie, 1993; Hannon *et al.*, 1993; Rees, 1995; Christensen, 1996; Maser, 1997; Hallsmith, 2003; Jepson, 2003)

The list below consists of land development principles that can be directly derived from our definition of sustainable development. This list is not meant to be exhaustive and our explanations of their connection to theory are certainly debatable. There are other principles that could be added and our explanations might be revised or different explanations substituted. Still, we believe that these 14 principles capture the essential land-use dimensions of sustainability that are applicable to all communities.

(1) **Jobs–housing balance**. Proximity in terms of the crucial human system activities of living and working will increase productivity and efficiency and also reduce natural resource consumption and waste generation.
(2) **Spatial integration of employment and transportation**. Facilitated access will improve systemic connectivity and increase productivity and efficiency among the residents of the human system.
(3) **Mixed land use**. Increased proximity and diversity in terms of available interactive opportunities among the residents of a community will result in reduced transportation energy consumption and improved organizational efficiency.
(4) **Use of locally-produced, clean, and renewable energy sources**. An energy strategy that replaces imported energy with energy that is locally produced, clean and renewable will help maintain the long-term sustainability of a community by matching its growth and development with local carrying capacity.
(5) **Energy and resource efficient building and site design**. Constructing buildings under energy-efficient guidelines will protect against natural resource depletion and make renewable alternatives (i.e. non-fossil fuels) more feasible.
(6) **Pedestrian access (walking and biking) to work and leisure**. Increasing the amount of non-motorized transportation will reduce transportation energy consumption and protect against resource depletion and pollution, as well as having positive health impacts on the residents of a community.
(7) **Housing affordability (for all income groups)**. A lack of affordable housing for all income groups is a manifestation of a lack of empowerment among some residents of the community (as agents in a system). The provision of adequate housing for all income groups will help protect against social (systemic) dysfunction.
(8) **Housing diversity (of style, type and tenure)**. Sustainable systems are marked by diversity in terms of agents and interactions. A diverse housing stock will encourage interactions among people with more diversity of backgrounds, interests and skills.
(9) **Higher density residential development**. More compact development will reduce the development pressure on open space, which is an essential

biological and agricultural resource necessary for preservation of both the local human community as well as the human system in general.

(10) **Protection of natural and biological functions and processes**. Due to its reliance on nature, the sustainability of the human system requires that the integrity of natural systems be maintained.

(11) **Resident involvement and empowerment**. Increased organizational capacity among the residents of a neighborhood increases the ability of that neighborhood to identify and respond appropriately to changing conditions.

(12) **Social spaces (public spaces to encourage social gathering)**. Increased social contact among the residents of a community can improve the community's ability to organize and respond to changing conditions.

(13) **Sense of place**. A sense of place increases attachment to place. This increases the propensity toward meaningful involvement and interaction, which improves a community's ability to organize and respond to changing conditions.

(14) **Inter-modal transportation connectivity**. Increased connective efficiency will (a) create the opportunity for increased frequency of interactions among the residents of a community, and (b) reduce dependency on modes that are polluting and highly energy-consumptive.

Method

Our research objectives are: to determine how planners conceive of smart growth, new urbanism, and ecological city in relation to sustainable development; and to identify variations in such perceptions relative to individual and community characteristics. To accomplish these research objectives, an Internet survey was developed and distributed to planning practitioners and academics in the USA. For each of the 14 development principles, we asked respondents to identify with which of the three development approaches—new urbanism, smart growth, and ecological city—they felt it was 'associated as a core development principle.' We purposely left the three approaches undefined and placed no restrictions on how many approaches could be selected. In the survey, we also included questions about the size of their community[1] and its regional location, their position, their number of years practicing, and their educational attainment.

The survey was sent as a link to an email message using Survey Monkey. Participation was requested three times: first on 9 September 2009 and 15 September 2009 (for practitioners and academics, respectively), then with a follow-up reminder on 24 September 2009 and a final request on 13 October 2009. Approximately 900 academics were identified and contacted through the PLANET listserv. Practitioners were identified by going directly to community websites and searching for the presence of either a planning office or a community development office with a planning division. If email contact information for personnel was available, up to two survey participants per community were randomly selected among individuals who were either office directors, planners by title, or shown to be members of the American Institute of Certified Planners (AICP). The total number of practitioners contacted was 1,124.

Survey Results

Respondent Characteristics

Out of the 2,024 surveys that were sent, 357 were returned, for an overall response rate of 17.6%. The response rates were 26.1% for practitioners (294 surveys returned out of 1,124 sent) and 7.1% for academics (63 surveys returned out of approximately 900 sent). As can be seen in Figure 1, the geographic pattern of the responses was highly correlated with their pattern of distribution ($r = 0.93$, $n = 9$, $p = 0.0001$).[2]

'Planning directors' and 'staff planners' constituted the two largest groups of respondents, accounting for 36% and 31% of the total respondents, respectively. Of the remaining 114 respondents, 55% identified themselves as 'academic', about half that amount as 'community development director,' and the remaining 18% as 'other.' The survey respondents are a fairly experienced group, with 70% of them having practiced planning for more than 10 years and only 2% for 2 years or less. Because of the comparative numbers of small and large cities and the method of selection (i.e. no more than two planners per city), the most respondents were employed by cities in the lowest population range (those with less than 50, 000 people) and the fewest by cities in the highest (those with more than 500, 000 people). Finally, a significant portion (30%) of the respondents indicated that they did not have a post-secondary planning degree. Given that all respondents hold planning or community development positions, we find this surprising and suspect that it may reflect a misinterpretation of the term 'post-secondary' to mean 'graduate.'[3]

Response Characteristics

The responses to the survey provide information about the three development approaches, as well as about the planners who responded. This information is in

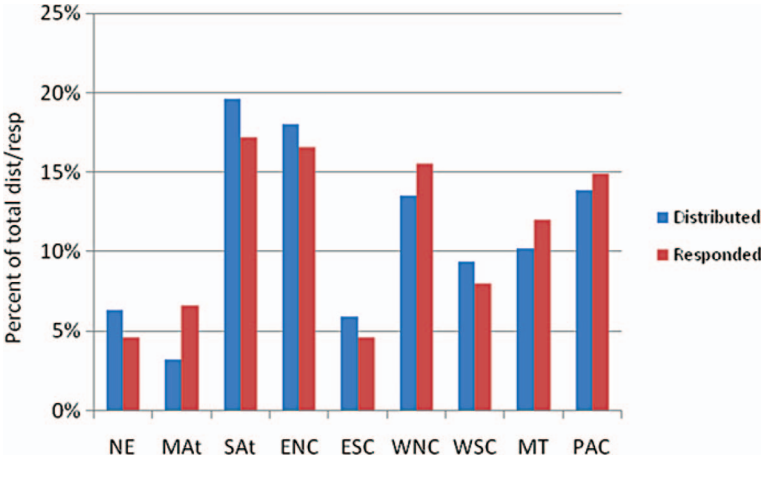

FIGURE 1. Comparison of survey distribution and response patterns. *Note*: NE, New England; MAt, Middle Atlantic; SAt, South Atlantic; ENC, East North Central; ESC, East South Central; WNC, West North Central; WSC, West South Central; MT, Mountain; PAC, Pacific.

terms of selection frequency (how many times the development approaches were associated with the development principles) and familiarity. Selection frequency provides an indication of the extent to which each development approach is correlated with the concept of sustainable development as we have defined it.

Each of the development approaches could have been selected a maximum of 14 times, once for each of the development principles. Since there were 357 surveys returned, this means that each development approach could have been selected 4, 998 times; such a selection frequency would indicate perfect correlation with our definition of sustainable development. As shown in Figure 2, the total selection frequency of smart growth came within 65% of that potential (3, 236/4, 998); new urbanism was second, at 54%, and ecological city third, at 47%.

Development principles and development approaches can be said to have *average selection frequencies*. In the case of development principles, this is calculated as the number of times a principle was matched with a development approach divided by the number of respondents. Since there are three development approaches, each development principle has a maximum possible average selection frequency of 3.0 (if every respondent matched it with every development approach). For example, a development principle selected 850 times would have an average selection frequency of 2.4 (850/357 respondents). In the case of development approaches, this is the number of times it was matched with a development principle divided by the number of respondents. Since there can only be one match per respondent, this selection frequency is essentially equal to the proportion of times that respondents matched the approach with a principle. For example, if new urbanism were matched with one of the development principles 180 times, it would have an average selection frequency of 0.56 (180/357 respondents). Average selection frequencies for development approaches are also calculated across groups of respondents. This is the number of times a group matched the development approach with the development principles divided by the number in the group. Since there are 14 development principles, each

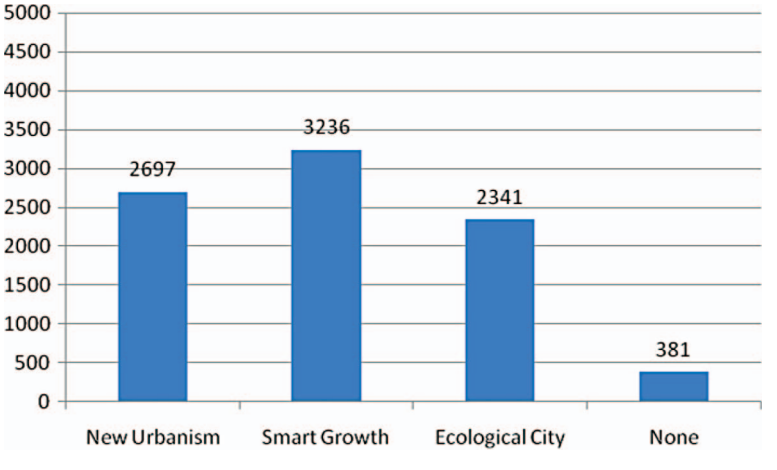

FIGURE 2. Total selection frequency (maximum of 4,998).

development approach has a maximum selection frequency of 14.0. A group of $n = 120$ (planners from the Pacific states, for example) that matched new urbanism with the development principles 840 times would have an average selection frequency for new urbanism of 7.0 (840/120 respondents).

A survey similar to the one conducted for this research was conducted in 2005 but never publicly reported.[4] While differing in some ways from the present survey, it requested that respondents make the same association between the same 14 development principles and three development approaches. As can be seen in Figure 3, the average selection frequencies have changed somewhat over time, with both smart growth and ecological city becoming more strongly associated and new urbanism slightly less strongly associated with sustainable development over the past 4 years.

On the present survey, the average selection frequency was found to vary significantly between several groups for different development approaches. Those with higher average selection frequencies can be viewed as being more *expansive* than those with lower average selection frequencies. As shown in Table 1, planning directors had a less expansive definition of new urbanism than staff planners (7.3 average selection frequency compared with 8.2, respectively); academics differed from practitioners in their definitions of new urbanism (less expansive) and ecological city (more expansive); more-experienced planners were more expansive than less-experienced planners in their definitions of smart growth and ecological city; and planners in large cities had a significantly more expansive collective definition of ecological city than planners in smaller cities.

The average selection frequencies were fairly consistent across regions, except for four cases. As can be seen in Table 2, all of the significant differences were in relation to ecological city: the New England, Middle Atlantic and Pacific regions all had significantly more expansive definitions, while the East North Central region's definition was the least expansive.

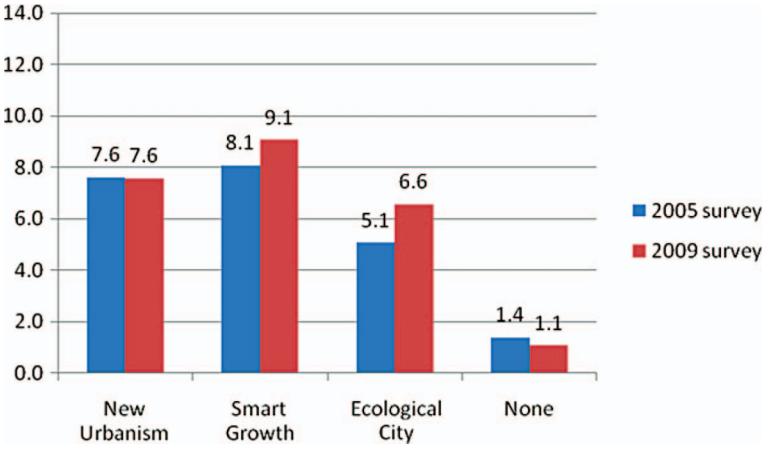

FIGURE 3. Selection frequency comparison (maximum of 14.0).

What would be the character of development that corresponded to survey selection frequencies? The answer to that requires that an average selection frequency for each development principle be calculated. The results of these calculations are shown in Table 3. As can be seen, it would be most likely to have pedestrian accessibility, mixed land use and higher-density residential development. It would be least likely to have affordable housing and high levels of citizen involvement, or to be powered by clean, renewable energy.

Table 4 depicts average selection frequency by development approach. The number in parentheses next to each average selection frequency is the ranking of that principle under that development approach. For example, 'Jobs–housing balance' had an average selection frequency of 0.83 for smart growth, which

TABLE 1. Significant variations in average selection frequency (maximum of 14.0)

Group	New urbanism	Smart growth	Ecological city
Planning directors ($n = 63$)	7.3	9.2	6.1
Planning staff ($n = 108$)	8.2	9.2	6.7
	$z = 1.96$*	$z = 0.03$	$z = 1.29$
Academics ($n = 63$)	6.9	8.5	7.7
Practitioners ($n = 288$)	7.7	9.2	6.3
	$z = 2.16$*	$z = 1.54$	$z = 2.57$**
0–10 years planning practice ($n = 105$)	7.7	8.5	5.8
>10 years planning practice ($n = 248$)	7.6	9.4	6.9
	$z = 0.30$	$z = 2.25$*	$z = 2.49$**
$>500{,}000$ population ($n = 41$)	7.0	9.1	8.2
$0 - 500{,}000$ population ($n = 311$)	7.7	9.1	6.4
	$t = 1.46$	$t = 0.02$	$t = 3.22$**

*$p < 0.05$, **$p < 0.01$.

TABLE 2. Average selection frequency by region (maximum of 14.0)

Region	New urbanism	Smart growth	Ecological city
New England	8.6	10.6*	7.5
Middle Atlantic	7.0	9.4	9.0**
South Atlantic	7.8	9.0	6.2
East North Central	7.2	9.2	5.7*
West North Central	7.2	9.3	5.4
East South Central	8.1*	9.2	6.6
West South Central	8.3	9.0	6.5
Mountain	7.0	8.4	5.9
Pacific	7.5	9.0	7.7*
Average	7.6	9.2	6.7
Pearson correlation between familiarity and average selection frequency	−0.09	0.59	0.84

Indications of significant difference with remaining regions: **$p < 0.01$, *$p < 0.05$.

TABLE 3. Average selection frequencies for development principles across development approaches (maximum of 3.0)[a]

Development principle	Average selection frequency
Pedestrian access (walking and biking) to work and leisure	2.25
Mixed land use	2.07
Higher-density residential development	1.97
Inter-modal transportation connectivity	1.91
Spatial integration of employment and transportation	1.78
Social spaces (public spaces to encourage social gathering)	1.66
Sense of place	1.62
Energy-efficient and resource-efficient building and site design	1.59
Protection of natural and biological functions and processes	1.56
Jobs–housing balance	1.55
Housing diversity (of style and type)	1.54
Housing affordability (for all income groups)	1.25
Use of locally-produced, clean and renewable energy	1.23
Resident involvement and empowerment	1.22
Average	1.66

[a]The average selection frequency for development principles across development approaches is calculated as the total number of times they are matched with one of the three development approaches by the total number of respondents.

ranked third highest out of the 14 development principles for that development approach. The shaded cells in the table indicate where there is the greatest separation between the highest and the lowest selection frequencies (formula: highest selection frequency minus the average of the other two). Thus, these cells depict the seven strongest levels of associations between development approaches and development principles. As can be seen, new urbanism is identified as being strongest compared with the other two approaches in terms of its provision of social spaces and sense of place, smart growth in terms of its provision of jobs–housing balance and affordable housing and ecological city in terms of energy renewability, energy and resource efficiency and protection of nature.

The survey also asked all respondents to indicate their level of familiarity with each of the development approaches. As shown in Figure 4, respondents professed to be most familiar with smart growth and new urbanism and far less familiar with the ecological city.

Figure 5 shows the percentage of academics that comprised the total number of respondents who indicated high levels of familiarity with the development approaches. As can be seen, that percentage is very high for ecological city. The percentages for new urbanism and smart growth are about equal to the percentage of the respondents who were academics, and therefore about what might be expected.

Table 5 shows only the groups with significant variations in level of familiarity. As can be seen, practitioners were less familiar than academics with all three development approaches, and (as suggested by Figure 5) especially ecological

TABLE 4. Average selection frequencies for development principles by development approach (maximum of 1.0)

Development principle	New urbanism	Smart growth	Ecological city
Jobs–housing balance	0.38 (7)	**0.83 (3)**	0.33 (10)
Spatial integration of employment and transportation	0.89 (1)	0.84 (2)	0.43 (7)
Mixed land use	0.89 (3)	0.81 (4)	0.43 (6)
Use of locally-produced, clean and renewable energy	0.08 (13)	0.25 (14)	**0.90 (1)**
Energy-efficient and resource-efficient building and site design	0.25 (11)	0.48 (12)	**0.85 (3)**
Pedestrian access (walking and biking) to work and leisure	0.88 (3)	0.78 (6)	0.60 (4)
Housing affordability (for all income groups)	0.34 (10)	**0.71 (7)**	0.20 (13)
Housing diversity (of style and type)	0.71 (6)	0.65 (8)	0.18 (14)
Higher-density residential	0.77 (5)	0.79 (5)	0.40 (8)
Protection of natural and biological functions and processes	0.15 (12)	0.52 (10)	**0.89 (2)**
Resident involvement and empowerment	0.34 (10)	0.54 (9)	0.34 (9)
Social spaces (public spaces to encourage social gathering)	**0.89 (1)**	0.50 (11)	0.27 (11)
Sense of place	**0.89 (2)**	0.48 (13)	0.25 (12)
Inter-modal transportation connectivity	0.55 (7)	0.88 (1)	0.48 (5)
Averages	0.54	0.65	0.47

Note: Data presented as the average selection frequency for that development principle (rank of that principle among the 14 for that development approach, with 1 being highest ranked). Shaded cells are the seven highest selection frequencies, found by subtracting the average of the two selection frequencies from the highest.

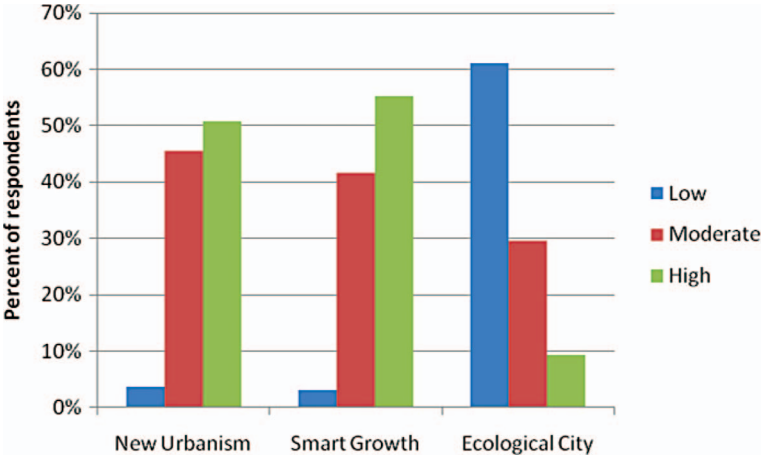

FIGURE 4. Level of familiarity.

city. Similarly, there was a consistently lower (although less significant) level of familiarity among planners in small cities compared with planners in large cities. Also, years of experience only affected familiarity with ecological city, with more

experienced planners being more familiar with the approach than those with less experience.

Level of familiarity was found to be related to average selection frequency. As shown in Figure 6, there was a pronounced increase in average selection frequency as level of familiarity with ecological city increased. That is, respondents who expressed high levels of familiarity with the approach also provided a more expansive definition of its development principles than those with lower levels of familiarity. This was found to be far less true with new urbanism and smart growth.

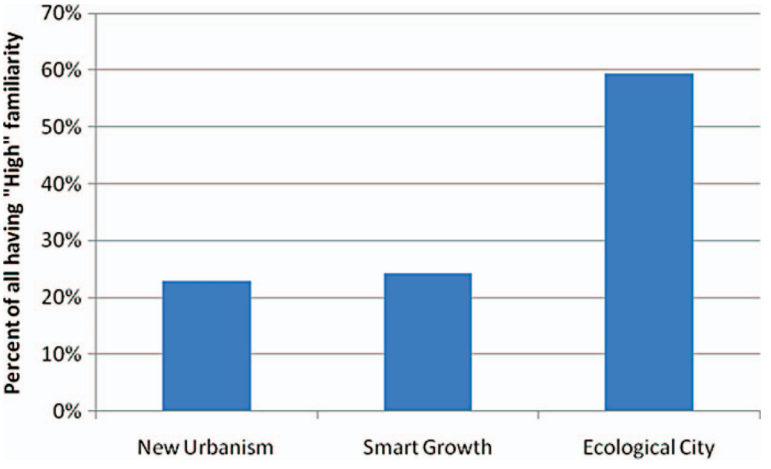

FIGURE 5. Academics and level of familiarity.

TABLE 5. Significant variations in level of familiarity (maximum of 3.0)

Group	New urbanism	Smart growth	Ecological city
Academics ($n = 63$)	2.6	2.7	2.0
Practitioners ($n = 289$)	2.4	2.5	1.4
	$z = 2.66$***	$z = 4.21$***	$z = 5.53$***
$>500{,}000$ population ($n = 41$)	2.6	2.7	2.0
$<500{,}000$ population ($n = 309$)	2.5	2.5	1.4
	$t = 2.02$*	$t = 2.78$**	$t = 4.61$***
Planning degree ($n = 238$)	2.6	2.6	1.5
No planning degree ($n = 114$)	2.3	2.4	1.4
	$z = 5.01$***	$z = 3.97$***	$z = 1.08$
0–10 years planning practice ($n = 105$)	2.4	2.5	1.3
>10 years planning practice ($n = 246$)	2.5	2.5	1.5
	$z = 1.25$	$z = 1.47$	$z = 2.98$**

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Could this relationship be due to the influence of academics, a group that was found to both comprise a large proportion of the respondents who were highly familiar with ecological city (Figure 5) and to have a significantly more expansive definition of the approach than practitioners (Table 1)? As shown in Figure 7, the positive relationship between level of familiarity and average selection frequency was found to exist for both groups.

Table 6 shows the impact of high levels of familiarity on average selection frequency. While the averages for smart growth and ecological city are equal among all respondents with high levels of familiarity with these approaches (0.67), the definition of ecological city expands considerably among academics; in fact,

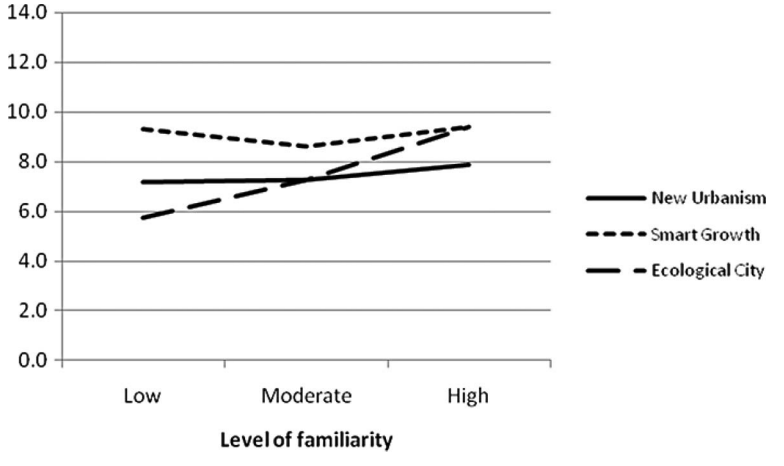

FIGURE 6. Average selection frequency by level of familiarity with the approaches (maximum of 14.0).

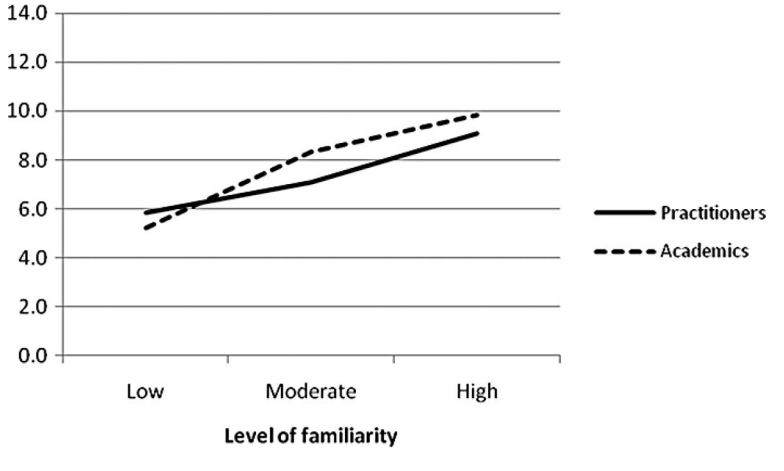

FIGURE 7. Average selection frequency by level of familiarity for academics and practitioners (maximum of 14.0).

TABLE 6. Average selection frequencies among those with high levels of familiarity (maximum of 1.00)

	New urbanism		Smart growth		Ecological city	
Development principle	All ($n = 179$)	Academics ($n = 41$)	All ($n = 194$)	Academics ($n = 47$)	All ($n = 32$)	Academics ($n = 19$)
Jobs–housing balance	0.43	0.34	0.82	0.83	0.53	0.53
Spatial integration of employment and transportation	0.52	0.37	0.85	0.83	0.69	0.74
Mixed land use	0.85	0.83	0.83	0.87	0.75	0.79
Use of locally-produced, clean and renewable energy	0.09	0.05	0.26	0.19	1.00	1.00
Energy-efficient and resource-efficient building and site design	0.27	0.27	0.48	0.36	0.97	0.95
Pedestrian access (walking and biking) to work and leisure	0.90	0.90	0.81	0.83	0.78	0.84
Housing affordability (for all income groups)	0.36	0.20	0.73	0.64	0.41	0.42
Housing diversity (of style and type)	0.75	0.80	0.69	0.64	0.38	0.37
Higher-density residential	0.80	0.76	0.82	0.94	0.63	0.63
Protection of natural and biological functions and processes	0.20	0.15	0.54	0.45	1.00	1.00
Resident involvement and empowerment	0.32	0.22	0.58	0.47	0.44	0.47
Social spaces (public spaces to encourage social gathering)	0.89	0.85	0.55	0.51	0.47	0.53
Sense of place	0.90	0.85	0.53	0.51	0.66	0.74
Inter-modal transportation connectivity	0.57	0.41	0.90	0.94	0.69	0.74
Average	0.56	0.50	0.67	0.64	0.67	0.70
Count < 0.50	6	8	2	4	4	3

Note: Shaded cells indicate development principles that changed from either > 0.50 to < 0.50 or from < 0.50 to > 0.50.

its average selection frequency of 0.70 is now highest. Further, the number of principles that were selected by less than 50% of the respondents decreases from 4 to 3, while it increases from 6 to 8 for new urbanism and from 2 to 4 for smart growth.

The average selection frequencies of smart growth and new urbanism were found to be positively correlated, while the ecological city approach was negatively correlated with both of those approaches, as shown in Table 7. Thus, the relationship between ecological city and the other two approaches can be said to be complementary in nature, covering different dimensions of sustainable development.

With respect to regional effects, Table 8 shows the average levels of familiarity to be fairly consistent across regions. Planners in the Middle Atlantic region had a comparatively high level of familiarity with ecological city compared with planners in other regions, and planners in central and mountain states tended toward the lowest levels of familiarity with that development approach.

When the scores from Tables 2 and 8 are combined (by dividing each score by its respective average and then adding these values from each table together), the Middle Atlantic Region ranks highest, as shown in Table 9. This score indicates that a developer in that region is more likely to find planners who are familiar with the three development approaches and have higher expectations as to the character of that development than is the case in other regions. Such planners are least likely to be found in Mountain region states.

TABLE 7. Pearson correlations of average selection frequencies

	Smart growth	New urbanism	Ecological city
Smart growth	1.00	0.39	−0.42
New urbanism	0.39	1.00	−0.59

TABLE 8. Average level of familiarity by region (maximum of 3.0)

Region	New urbanism	Smart growth	Ecological city
New England	2.5	2.6	1.5
Middle Atlantic	2.6	2.7	1.9**
South Atlantic	2.5	2.6	1.6
East North Central	2.4	2.6	1.4
West North Central	2.4	2.6	1.3
East South Central	2.6	2.5	1.3*
West South Central	2.4	2.4	1.3*
Mountain	2.5	2.5	1.3*
Pacific	2.4	2.4	1.6
Average	2.5	2.5	1.5

Note: Indications of significant difference with remaining regions: $^{**}p < 0.01$, $^{*}p < 0.05$.

TABLE 9. Sorted combined familiarity (Table 8) and average selection frequency (Table 2)

Region	New urbanism	Smart growth	Ecological city	Total
Middle Atlantic	2.0	2.1	2.6	6.70
New England	2.1	2.2	2.1	6.47
Pacific	1.9	1.9	2.2	6.10
South Atlantic	2.0	2.0	2.0	6.04
West North Central	2.1	2.0	1.9	5.97
West South Central	2.0	1.9	1.8	5.78
East North Central	1.9	2.0	1.8	5.75
East South Central	1.9	2.0	1.7	5.64
Mountain	1.9	1.9	1.8	5.56

Note: The combined score was calculated by dividing the two scores from Tables 2 and 8 for each indicator by its respective average and then adding them together. For example, New England's Smart Growth score of 2.2 is equal to (10.6/9.2) + (2.6/2.5).

Discussion

The advocates for each of the approaches tend toward an expansive definition: new urbanism, smart growth and ecological city are all presented as integrations of environmental, social and procedural dimensions that are crucial to sustainable development. However, when the approaches are reviewed by the surveyed planners in terms of 14 principles of sustainable land development, each falls short of this ideal in its own way.

Smart growth is defined most expansively by the respondents. Of the 14 development principles, 11 were associated with smart growth by more than 50% of the respondents. However, this model of smart growth development is deficient with respect to clean, renewable energy, energy-efficient and resource-efficient building and site designs, and sense of place (all having average selection frequencies of less than 0.50). New urbanism was defined less expansively overall than smart growth (associated with eight development principles by more than 50% of the respondents), but was especially strong in two areas in which smart growth (and ecological city) was weak: social spaces and sense of place.

Finally, respondents defined ecological city least expansively of the three approaches (associated with only four development principles by more than 50% of the respondents). Of course, such a restricted definition can be easily drawn, not from specific knowledge about the development approach but simply from its name, which might also lead one to conclude that ecological city would be weak in such non-environmental principles as social spaces, resident involvement and empowerment, sense of place and housing affordability and diversity. And, in fact, this was found to be the view of the respondents: these five principles scored the lowest under ecological city, with an *average* average selection frequency of 0.24 (compared with new urbanism's score of 0.71 and smart growth's score of 0.58 for these same principles).

However, of the three approaches, ecological city's definition was found to expand the most as familiarity increases. Among those most familiar with the

approach, its *average* average selection frequency was 0.67 (up from 0.47 among the respondents generally), which equals the score of smart growth and exceeds that of new urbanism (0.56). Moreover, the score for the five non-environmental principles increased to a more respectable average of 0.47, compared with 0.64 and 0.62 for new urbanism and smart growth by those most familiar with those two approaches.

Familiar academics were even more expansive in their collective definition of ecological city. They scored it highest overall of the three approaches (with a 0.70 *average* average selection frequency). The scores for two of the five non-environmental principles (social spaces and sense of place) also surpassed 0.50, leaving only three development principles with scores less than .50, compared with eight and six for new urbanism and smart growth, respectively. It seems that, as planners learn more about it, ecological city looks bigger and better until, finally—among academics at least—it is viewed as the most sustainable development approach. Meanwhile, familiarity with new urbanism and smart growth breeds some measure of, if not contempt, then discontent.

When the results of this survey are compared with the results of one conducted in 2005, the ecological city definition has expanded the most, increasing in 'size' by almost 30% (compared with an expansion of 12% for smart growth and a slight contraction for new urbanism). This suggests that planners may be becoming more familiar with the concept. If so, it is still low, with less than 10% claiming a high level of familiarity in this survey—and of those, more than 60% are academics. It would appear then, that planning academics, have an important role to play in raising ecological city to a higher level of familiarity (and, therefore, relevance to the sustainable development challenge) among planning practitioners.

The survey results also indicate a fair amount of variation when planners are grouped according to geography and practitioner status. Generally speaking, the most expansive definition of new urbanism is likely to be found among planning staff in East Central States, of smart growth among experienced planners in New England, and of ecological city among experienced planners in large cities in the Middle Atlantic and Pacific regions. The least expansive definition of ecological city can be expected to be found among planners with less experience in small cities in the East North Central states.

However, it is worth pointing out that these are exceptions. Among regions, there were only five significant variations in average selection frequency out of 27 groupings (9 regions x 3 development approaches) and only four significant variations in level of familiarity, all in relation to ecological city. Among the three other professional and geographical groupings (city size, length of practice, position), there could have been as many as 119 instances of significant variation (a 7 x 17 matrix); in fact, only 13 were found, which is a discovery rate of about 10%.

Conclusion

Sustainable development is a complex concept on which to base development strategies. Smart growth, new urbanism and ecological city are all portrayed by their advocates as ways to operationalize the concept of sustainable development.

To the extent that they are deficient is the extent to which we will fail in such operationalization. In this paper, we have tried to operationalize sustainable development by identifying 14 development principles that are rooted in a systems-based definition of the term.

Using those as the measurable standard, this study reveals the planning profession to collectively view each of the development approaches very differently in terms of their contribution to sustainable development.

Planners as a group have relatively high expectations regarding what can and should be accomplished under each of the three development approaches. Of the three approaches, smart growth had the highest selection frequency and was also the most familiar to the respondents, while ecological city had the lowest selection frequency and was the least familiar. Interestingly, while the selection frequency for all three development approaches increased with familiarity, the increase was much higher for ecological city than it was for either smart growth or new urbanism.

These findings suggest the need for the planning profession to define some sort of hybrid approach that combines characteristics of all three approaches. For example, while the smart growth approach as conceived by planners may help achieve greater jobs–housing balance, it is likely to leave sense of place unaddressed. And while new urbanism may fulfill that dimension, it is not viewed as an approach that will lead to communities that are energy self-reliant, which is more likely under an ecological city approach to development.

The ecological city approach was found to be most complementary to the other two approaches in terms of their respective areas of strength and weakness. Thus, it has the potential to provide insights that will improve planning for sustainability in the USA. This suggests a need to increase its level of familiarity among planners. One obvious way to do that would be to increase its presence in the planning literature, particularly journal articles.[5] A review of its presence in planning academics would also be useful. Is it as prominently a featured topic of study in planning courses as smart growth and new urbanism? And as importantly, if not, why not?

To a great extent, reality reflects our concepts. In this case, development will tend to match whatever expectations we have regarding what can be accomplished. Given planners' position of influence with respect to public policy, we have a responsibility to expand awareness of the limitations of each of the approaches and build a better, more comprehensive alternative. By gaining a clearer sense of how we as planners collectively define development approaches such as smart growth, new urbanism and ecological city (as well as how our definitions differ), the profession can begin to lead toward that greater potential.

Notes

1. The word 'community' was not specifically defined on the survey. In the USA, it is generally and typically understood to mean the municipality at the sub-county level.
2. Regions as delineated by the US Department of Commerce.
3. This suspicion is reinforced by the fact that almost 40% (50 out of 128) of the planning directors and 15% (10 out of 63) of the planning academics also reported not having a post-secondary planning degree.
4. The 2005 survey was sent to 3, 033 planning practitioners and academics, of whom 365 responded.
5. Unlike smart growth and new urbanism, ecological city is not well represented in the US planning literature. There is neither an American Planning Association policy guide (as there is for smart growth; American

Planning Association, 2002) nor a Planning Advisory Service report (as there is for new urbanism; Barnett, 2004), and 2009 electronic searches revealed no books in the American Planning Association's online bookstore and only 11 articles in planning journals with either the term ecological city or eco-city in their titles (compared with 63 and 52two for smart growth and new urbanism, respectively).

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