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Sustainable Transportation and Land Development on the Periphery: A Case Study of Freiburg, Germany and Chula Vista, California

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Abstract

This paper examines two land developments in the cities of Freiburg (Germany) and Chula Vista (California) with the purpose of comparing their transportation and land use planning institutions, processes, and actions for the importance placed on achieving sustainability. Planning practicioners in both places are committed to concepts of sustainability, but their respective attempts to achieve sustainability differ dramatically. Freiburg is pursuing relatively high density land development in conjunction with transit service, while Chula Vista is pursuing relatively low density, auto-oriented land development patterns.

Introduction

"Sustainability" is a complicated concept with multiple and contestable meanings. In this paper we probe the complexity and contestability of that concept by comparing new land development projects on the peripheries of Freiburg (Germany) and Chula Vista (California). In particular, we examine how transportation planning institutions, processes, and actions interact with land use planning institutions, processes, and actions to make urban areas in Germany and the United States either more or less sustainable.

We compare Freiburg and Chula Vista partly because planning practitioners in both places expressly seek to sustain features of their cities that they consider particularly admirable. In some respects, the qualities they seek to sustain are quite similar. For

example, both cities seek to have thriving economies, and both want healthy natural environments along with convenient access to parks and other natural amenities.. In other respects, the two cities differ quite dramatically. Freiburg seeks to extend its rich culture and architectural heritage into the design of new developments, whereas Chula Vista seems to have a more attenuated sense of history and has turned away from the street pattern and other urban design characteristics that give form to its older neighborhoods. The differences between the two cities are most noticeable with regard to the design of the new developments that we report upon here. The new developments differ in terms of their preference for private motor vehicles versus public transit, bicycling and walking; in their preference for low-density, single-family residential units versus higher-density multi-family structures; in their preference for development designs that separate by both income and type of land use; and in their efforts to provide housing units that lower-income households can afford.

But we also compare these two cities because – different as they are – they both raise questions about the sustainability of any land use/transportation strategy that focuses exclusively on local desires and consequences. The fact that the two cities (and new developments) differ in which qualities they consider desirable and want to sustain raises questions about whether either pattern can be sustained over time. Asked differently, can one land use/transportation pattern be considered more sustainable than the other if neither of them explicitly accounts for consequences that are borne in other places and other times?

Sustainability

The concept of sustainability emerged out of the polarized conflict between advocates of environmental preservation and advocates of economic development in the 1970s. At that time, environmentalists were claiming that continued exponential growth in a finite environment would soon encounter natural limits. Gradually, this "limits to growth" argument lost credibility, primarily because it seemed to dismiss claims that economic growth was needed to alleviate starvation, disease, and poverty (Torgerson, 1995).

In 1987, the World Commission on Environment and Development issued a report which defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (p. 43). This would be "a type of development that integrates production with resource conservation and enhancement, and that links both to the provision for all of an adequate livelihood base and equitable access to resources" (pp. 39-40). In the Commission's view, sustainability would require action at the global, national, and local scales. Five years later, at the United Nations Conference on Environment and Development in Rio de Janeiro, several heads of national governments embedded the idea of sustainable development into a package of agreements, including a biodiversity convention, a climate change convention, a statement on forest principles, an agreement to work towards a desertification convention, the Rio declaration on environment and development, and Agenda 21, an 800-page plan for implementing the Rio Declaration.

This pursuit of sustainability at the international level has been complicated by the fact that "sustainable development" has been defined in a wide variety of ways (Torgerson, 1995; Lafferty, 1998). Sustain what? Sustain for how long? Sustain for whom? Sustain under what conditions?[1]

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[1] Many scientists and technical experts prefer to avoid using the concept, claiming that ambiguous concepts lead to unclear communication and trouble (Lafferty, 1998). Many environmentalists tends to reject the concept as an oxymoron; they stress the fragility of natural ecosystems and object to the technically-focused, human-centered character of the discourse about sustainability. Conversely, anti-environmentalists often argue that pursuing sustainable development means appeasing environmentalists; it is just a term used to mask a hidden anti-growth agenda (Torgerson, 1995); similarly market liberals resist the seemingly intrusive hand of government that accompanies sustainable development. And social justice advocates (e.g., Chatterjee and Finger, 1994) have argued that the leaders who assembled at the Rio Conference failed to tackle the major causes of environmental problems, most notably Northern consumption, unsustainable patterns of development in the South, militarization, and the destructive practices of transnational corporations.

In our view, the fact that the concept has multiple and contestable meanings is not a problem to be solved or avoided; rather, we see it as as a concept which derives meaning in practice; that is, its meaning is constructed socially through locally contingent processes of conflict, argumentation, negotiation, mediation, and consensus-building. It provides an opportunity for people to invent policies and actions which address the multiple claims made on sustainability. Those claims have to be articulated and argued in the face of opposition; that is, they act as particular suggestions which become part of locally-contingent conversations and arguments about how particular cities should develop. Scott Campbell (1996) makes a similar point. After arguing that sustainable development can be located in the space between environmental protection, economic growth and efficiency, and social justice, he concludes that "our sustainable future does not yet exist, either in reality or even in strategy. We do not yet know what it will look like; it is being socially constructed through a sustained period of conflict negotiation and resolution. This is a process of innovation, not of discovery and converting the nonbelievers" (p. 302). Similarly, Torgerson (1995, p. 11)

Despite the variety of criticisms and the ambiguity of the concept, the United Nations, regional authorities, nation-states, and local governments have established institutions and conducted activities designed to carry out Agenda 21. For example, the UN established the Commission on Sustainable Development in 1992, and sponsored the Oslo Symposium on Sustainable Consumption in 1994. In 1994, representatives from eighty cities met in Aalborg, Denmark, adopting what has come to be known as the Aalborg Charter, and organizing the European Sustainable Cities and Towns Campaign.

The United States' effort has been expressed most clearly by the President's Council on Sustainable Development (PCSD). Created by President Clinton in 1993, the PCSD issued its final report in 1996. "In the end," the Council reported (p. 6):

> we had found agreement around the idea that to achieve our vision of sustainability some things must grow -- jobs, productivity, wages, profits, capital and savings, information, knowledge, education -- and others -- pollution, waste, poverty, energy and material use per unit of output -- must not. We agree on growth, and agree that it must be defined and measured with care. The issue is not whether the economy needs to grow but how and in what way.

Stressing the importance of directly and meaningfully involving people in decisions that affect them, the PCSD also stressed the importance of shifting from polarized conflict to collaborative ways of making decisions. Arguing that "it is essential to seek economic prosperity, environmental protection, and social equity together" (p. 12), the Council proposed a set of 10 goals along with indicators for measuring progress toward achieving those goals. Unlike in Europe, however, only a few American cities seem to be explicitly striving to become more sustainable (see Beatley and Manning, 1997).

A central focus of this paper is to understand why there is such a difference between how European (or at least German) and American cities are responding to this challenge of sustainability. In the following sections, we provide a largely qualitative account of two

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and others have suggested that sustainable development might best be thought of as an "orienting vision"

cities' approaches to sustainable planning, synthesize various planning actions that have shaped growth on their peripheries, and assess this new growth for its adherence to the goals of sustainability.

Freiburg and the New Development of Rieselfeld

Freiburg is a city of almost 200,000 inhabitants located in the southwest of Germany. Growing at a rate of just under one percent per year, Freiburg is the fourth largest city in the German state of Baden-Wurttemberg. It is also part of a 9,000 square kilometer and 2 million person region in the Upper Rhine known as "The Regio." Lying between the Black Forest in Germany and the Vosges Mountains in France, the Regio includes Basle (Switzerland), Colmar and Mulhouse (France), and Strasbourg (Germany), as well as Freiburg. Freiburg and the Regio are centrally located in Europe and are well-connected by rail and autobahn to the continent's major cities.

Freiburg's primary industries include wood processing, electrical engineering, the design of medical devices, and chemical fiber manufacturing, but almost 74 percent of the city's work force is employed in the service sector. Freiburg is also the site of the Albert-Ludwigs-Universitat (with its more than 20,000 students). A moderately high percentage of the city's workers are unemployed (8.6 percent in 1993), and almost 18,500 residents (9.4 percent) are living on public assistance (Vancutsum, 1996). Partly as a result of these two facts, the city experiences a significant shortage of housing that lower-income residents can afford.

Freiburg is located at the western edge of the Black Forest, close to the Rhine River (see Figure 1). The city covers 15,306 hectares (roughly 60 square miles), including 6,473 hectares of forest (about 40 percent). The official guide to Freiburg claims that "the mountains, valleys, fields and woods in and around Freiburg are one single, large, natural 'health resort', providing everyone with health-giving recreation" (p. 55).

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that "is obviously open to dispute."

INSERT FIGURE 1 HERE

Freiburg's efforts to promote sustainability have focused primarily on pushing auto traffic out of the city center and maintaining a vital public transit system. Worried about the movement of families and retail activities to the suburbanizing periphery and about increases in traffic congestion, Freiburg decided in the mid-1970s to improve the quality of life in the city center. Initially that meant closing the major north-south traffic route to motorized traffic, but the closing was soon extended to most of the city center. By 1986, a firm consensus to maintain the pedestrianized city center had emerged. Only trams, buses, and pedestrians are currently allowed to travel in that area. Motor vehicular traffic in the city center is further discouraged by high parking fees (roughly two dollars per hour in the mid-1990s) and a ban on construction of new multi-story parking garages. Large bicycle parking areas are located at the entrances to the pedestrianized area, and they in turn are connected to an extensive network of bicycle paths (Lennard and Lennard, 1995).[2]

The fact that Freiburg is so tightly linked to the Black Forest helps explain another major shift in policy, which occurred in the mid-1980s. Alarmed by reports that the Black Forest was dying from "acid rain," Freiburg chose to improve public transportation services rather than to rely more heavily on private motor vehicles. Transferable monthly season tickets were introduced, at a 25 percent discount; new tram cars and lines were installed; Freiburg's transferable tickets were replaced by a monthly environmental transit pass for the entire Regio (which makes it possible for commuters to use the buses and trains of all public transit companies serving the commuter traffic in the urban district of Freiburg and the bordering rural districts); Freiburg joined with the Germany Railway Company and several other public transit companies to found the "Regio Integrated Transit System" (the RVF); the RVF adopted a common uniform joint rate, uniform terms of transportation, and uniform transit passes; it became possible to purchase single tickets, point cards, and 24-hour tickets. Figure 2 shows the city's current network of

[2] In 1976, there were only 41 km of bicycle lanes in Freiburg; today there are about 400 (Vancutsum, 1996).

tram and bus lines. Current plans call for future extension of existing lines, building new ones, and adding new bus and train lines in nearby rural areas.

INSERT FIGURE 2 HERE

The City's efforts have had a dramatic effect on travel patterns. Various measures of this effect are available. For example, although the number of cars registered in the city rose from 62,000 in 1979 to 78,286 in 1989, the amount of vehicular traffic remained steady at 232,000 car trips per day (Parsons Brinckerhoff Quade & Douglas with Pucher, 1998). Moreover, the number of passenger trips on public transport (including suburban rail) rose by 136 percent between 1980 and 1995 (Vancutsem, 1996). The net effect according to former Deputy Mayor Ungern-Sternberg (1997a) is a startling shift in modal split over The past 20 years, with much of the shift being due to the development and expansion of the city's high quality electric tram system:[3]

INSERT TABLE 1 HERE

New developments on the periphery of Freiburg are being planned in a manner that is highly compatible with (and which reinforces improvements in) the city's public transportation system. Rieselfeld, a new development on the western edge of the city (see Figure 1), is the lynchpin of this effort.

Rieselfeld is planned to be a mixed-use development for 12,000 people, 4,500 of whom will live in apartments.[4] It is located on a 320-hectare (800 acre) site which is entirely

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[3] Of course, not all of this shift in modal split can be attributed to Freiburg's policies. Taxes on the ownership and use of automobiles are extremely high in Germany; the gasoline tax is about $3 per gallon, and there is a motor vehicle excise tax of $2.00 - 7.50 per ccm depending on the engine and its pollution emission rate. Moreover, autobahns are mainly restricted to routes between (not within) cities, and only a portion of the gasoline tax is used to finance transport infrastructure (Parsons Brinckerhoff Quade & Douglas with John Pucher, 1998). As Parsons Brinckerhof puts it (p. 51): "The key to success in taming the automobile in Germany has been a coordinated, multifaceted strategy that has limited the intrusion of high-speed freeways into urban areas and simultaneously restricted automobile use and made it much more expensive while providing attractive, inexpensive alternatives to the auto."

[4] There is a very strong demand for new housing in Freiburg. This increased demand is directly related to immigration from the former states of East Germany. Other social changes (including increasing affluence and an increasing number of single-resident households) are increasing the average amount of living floor space per inhabitant, and hence reducing the availability of units that lower-income residents can afford.

owned by the City and had been used as a sewerage disposal site until the early 1980s. The Local Council decided to build on 78 hectares (175 acres) while leaving the remainder as a natural area,[5] which meant building at a rather high density (68.5 persons per acre, as compared with 15 per acre for the site as a whole) while also providing some single-family houses. This high density notwithstanding, none of the buildings are to exceed 5 stories in height.

To enable Freiburg to be developed at a high density without being overwhelmed by auto traffic, the plan called for extending one of the City's electric tram lines down the center of Rieselfeld and for providing shops and markets and offices along the tramway. Former Deputy Mayor Ungern-Sternberg (1997b, p. 285), for example, claims: "The aim of the Freiburg traffic policy is […] not the utopia of ousting the car from our reality, but in pursuing policies of alternatives, creating conditions where the use of cars can be kept to a minimum." To avoid problems deriving from segregation by socio-economic status and by land use, the plan also calls for a social balance between lower and higher income residents, between tenant and owner occupied units, and between residences and sites of employment. The development includes a primary school, a secondary school, a children's (day care) center, and three nursery schools. They have also set aside sites for two churches, and they have reserved land for a substantial amount of office space.

To a great extent, the design of Rieselfeld reflects learning from an adjacent district, Weingarten, which was developed as high rise apartments, with 80 percent of its units being targeted for social housing. Freiburg officials concluded that the combination of high rise units, lack of urban texture, and ghettoization of lower income families had created a neighborhood with distinct social problems. They did not want to repeat that mistake in Rieselfeld (see also Lennard and Lennard, 1995, p. 193-194). Thirty percent of the housing in Rieselfeld is intended for low-income households; about 800 subsidized rental apartments are dispersed throughout the first section of the development, along

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Building to the east of Frieburg seemed improper because of the Black Forest. Building in the existing city also seemed inappropriate because of the desire to retain open spaces (Siegl, 1998).

with about 600 owner-occupied units, with the designs being so similar that it is not possible to determine through design alone where the lower income people live. The development uses an estimated 52 percent less energy than it would otherwise as a result of using shared building walls, by building zero energy buildings,[6] by improving the power supply (Rieselfeld is connected to a nearby district heating facility), by urging residents to buy more efficient appliances, and by facilitating use of non-auto modes of transportation. Several of the buildings are designed to be accessible by people with disabilities; fifty percent of the apartments on the first floors must be accessible. Sidewalks have a "stone for blind persons" near the tram stops, and Rieselfeld's tram and street connections are easily accessible by people in wheelchairs or with baby strollers.

The next section describes EastLake, a relatively new development on the periphery of Chula Vista, California.

Chula Vista and the New Development of EastLake

Background

Chula Vista is located in San Diego County, the southernmost county in California (see Figure 3). The City of Chula Vista has undergone dramatic growth in the past two decades; doubling in population and area since 1980. Population grew from 84,000 in 1980 to about 156,000 in 1997, while the city's area has grown from approximately twenty square miles in 1980 to roughly fifty square miles in 1997.

INSERT FIGURE 3 HERE

The majority of Chula Vista's new development is located east of the Interstate 805 (see Figure 4). There are two large master-planned communities along with several smaller subdivisions planned for this area. The EastLake project was the first master-planned

[5] The Social Democrats, the Christian Democrats, and the Greens each control about one-third of the Freiburg City Council, and thus the physical development of Rieselfeld reflects a compromise between their respective political objectives (Ungern-Sternberg, 1997b; Siegl, 1998).

community approved for eastern Chula Vista (The EastLake Company 1998a, p.VI-I). It is being developed as a series of "neighborhoods"; with the first two neighborhoods—EastLake Hills and EastLake Shores—completed in 1986, and the third neighborhood, EastLake Greens, completed in 1991. The last three neighborhoods are scheduled to be completed by the year 2005.

INSERT FIGURE 4 HERE

Recreational facilities provide focal points for each of the neighborhoods. The Hills provides a swim and tennis club, the Shores provides a lake and beach club, and the Greens has a golf course. Retail, office, and community buildings are primarily located along the edge of the EastLake Greens neighborhood. The EastLake Company's literature as well as Chula Vista's planning documents describe a commitment to building mixed-use development in this area, with significant employment and commercial opportunities to encourage people to work, shop and play near their homes (The EastLake Company 1998a, p.II-1).

As a preliminary study of the sustainability of Chula Vista's new developments, we compare various characteristics for those areas east and west of the I-805. The east and west are similar in size, 8500 acres and 7300 acres, respectively; but they differ noticeably in their patterns of development.

Land Use and Development Patterns

In terms of land use patterns, more recently developed areas of Chula Vista are less dense than older areas (see Table 2)[7].

INSERT TABLE 2 HERE

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[6] In this context a "zero emission" building is one which uses a combination of passive solar design and energy conservation measures to avoid the need to import energy provided by fossil fuels. Energy is, of course, required to construct the houses and to fabricate the materials from which they are made.

[7] By 1990, almost forty percent of the EastLake project was complete.

Population density in the east is about 5.5 persons per acre while density in the west is about 12.2 persons per acre. Residential development in the east is also less dense than in the west (2 dwelling units/gross acre compared to 5 dwelling units/gross acre). These numbers seem to suggest that new patterns of growth in Chula Vista are consuming more land per person and per household than the city's older patterns of growth, although some of the land in the east may be dedicated open space.

The EastLake project provides useful insights into some of the factors that are shaping these new patterns of growth. Promotional literature published by the EastLake Company captures the essence of the type of community many Americans desire: the quiet, safety and peace of semi-rural environments combined with the convenience of nearby urban amenities.

> EastLake began with the land—3200 acres of it—serene and peaceful under California skies […], open ranges with spectacular vistas that reached the ocean. Next came the vision. A vision of California country life as it was meant to be lived. Safe. Serene. Easy. A feeling of living close to nature while enjoying all the comfort and convenience of home. It was the vision of a special community that would be insulated from the pace of the city, while within easy reach of downtown. (The EastLake Company 1998b)

Various local government approaches to transportation and land use planning have also contributed to lower population and residential densities in the eastern areas. Chula Vista's General Plan illustrates a clear commitment to maintaining the character of its single-family detached housing neighborhoods. For example, the Land Use Element reads, "It is the goal of the City to accommodate a full diversity of housing types, while maintaining an orientation to detached single-family living" (City of Chula Vista 1995, p.1-8). This planning goal has translated into low-density residential zoning designations for much of the eastern areas of Chula Vista. Moreover, the City would also like to lower residential densities in the central areas and restrict rezonings from single-family to multi-family. The City views high-density residential development in the older, central area of Chula Vista as a threat to the stability of single-family neighborhoods located there (City of Chula Vista 1995, p.1-9). Instead of accommodating some of the population growth

within the older urban areas by allowing increased densities, the City prefers (and is physically able) to expand eastward with low-density residential development.

Travel Behavior/Transportation Planning

Travel behavior of residents in the east and the west also differ. Table 3 shows mode shares and mean travel times for the journey-to-work trip. Almost 10% more residents in the east drive alone to work than residents in the west (80% compared to 70%). Less than two percent of the residents in the east use transit to get to work, while over five percent use transit in the west. Fewer residents in the east use alternate transportation (carpools, bikes or walking) to get to work than in the west (18.2% versus 24.4%). Interestingly, work trips for residents in the east are only slightly longer than in the west (22.3 minutes compared to 21.3 minutes).

The differences in mode shares for the work trip indicate that a greater level of auto dependence may be associated with the newer patterns of growth in Chula Vista. The similarity in work trip travel times between the east and west suggests, however, that congestion levels are not noticeably worse for the commuters in the east. This could be considered an achievement on the part of the City of Chula Vista: increased automobility without worsening congestion.

INSERT TABLE 3 HERE

The City's approach to managing new growth helps explain this outcome. In 1989, Chula Vista implemented a Growth Management Program in response to the public's concern with rapid growth. A Threshold Standards Policy was adopted by the City to preserve residents' quality of life (Leiter, 1996). The policy established minimum performance standards for transportation, water and sewer systems, as well as a range of other public services. The intent of these standards is to ensure that public facilities maintain a minimum level of service as new development occurs. With respect to the supply of transportation infrastructure, the standards require that new growth and its associated

travel demand do not push any facility's performance below Level of Service C. All new development therefore is phased so that adequate infrastructure is provided. In achieving this desired automobility for the eastern areas of Chula Vista, the City may have also diminished the potential for eastern residents to use other modes. Many of the street network characteristics that facilitate automobile travel in the east, make travel by other modes inconvenient. Several six-lane primary arterials form the backbone of the street network in the east. Many of the developments along these arterials have only one point of access to the arterial street network. Each of the three completed neighborhoods in the EastLake project, for example, has only two points of access to the arterial network. Local streets inside the EastLake neighborhoods provide little internal connectivity. These factors make it difficult for pedestrians to access transit stops along the arterials. In addition, auto speeds along the high-capacity arterials in the east make bicycle and pedestrian travel uncomfortable.

In contrast, the street system in the west does not have one dominant arterial; rather it is characterized by a dense, interconnected network of relatively low capacity streets. The western area has about 210 miles of street right-of-way with two miles of major arterial right-of-way; whereas the eastern area has 125 miles of street right-of-way with 18 miles of major arterials (see Table 3). Lower automobile capacities and speeds, along with the greater network connectivity, makes non-motorized travel easier in the west.

As with Chula Vista's land use planning efforts in the east, the transportation system outcomes are consistent with the City's goals: new development without traffic congestion. While this may be viewed as a local success, implications for broader goals of sustainability may not be as positive.

Social/Racial Equity

Chula Vista appears to have maintained a high degree of racial and ethnic integration in its newer areas (see Table 4). Percentages of minorities living in the east are almost the

same as those in the west. However, median household incomes for residents in the east and west are noticeably different, almost fifty percent higher in the east.[8]

INSERT TABLE 4 HERE

Reactionary Planning Efforts

Planning goals for the eastern areas of Chula Vista appear to be under reconsideration by the City. In the early to mid 1990's, Chula Vista embarked on planning efforts for the 23,000 acre Otay Ranch project, south of the EastLake property. The design approaches, particularly for the circulation system and the mixes of land uses, are different from the EastLake development. Many of these changes were most likely initiated by regional planning efforts in the early 1990's to encourage cities in the San Diego region to intensify zoning designations within a series of newly identified transit corridors (San Diego Association of Governments 1995). In addition, in 1992 the City of Chula Vista was asked to participate in a model program developed by the International Council of Local Environmental Initiatives (ICLEI) to reduce CO_2 emissions (City of Chula Vista 1998). The City has just completed its proposed CO_2 reduction plan, which identifies the possibility that existing and planned development patterns in eastern Chula Vista may cause higher levels of CO_2 emissions than urban patterns in the older, western area of the city. The planning efforts for Otay Ranch, which occurred concurrently with the City's involvement in broader sustainability efforts, seem to reflect a willingness to adjust transportation planning and land use planning efforts.

Summary and Directions for Further Research

Both Freiburg and Chula Vista intend to sustain features of their cities which they find particularly admirable. Although there are a few similarities, the qualities they seek to sustain (and how the cities seek to sustain them) differ rather dramatically.

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[8] The EastLake Company was required to construct 5% low-income housing and 5% moderate-income housing.

Blessed with a beautiful natural setting and a large university, Freiburg has an economy that is based primarily on health, tourism and education. Largely for that reason, one might say that it has a vested commercial interest in pursuing an environmentally-sound development pattern, at least at the local level. Its setting and economic dependence on health, tourism, and education provides its residents with a very strong incentive to devise innovative ways of thriving economically without harming the natural amenities of the place. Thus, Freiburg seeks to combine the qualities of vibrant city life with the relaxing pace of easily accessible woods, gardens and hills. In order to sustain these qualities, it has created an extensive pedestrianized city center, dramatically improved its electric tram and bus system, and greatly expanded its network of bicycle trails and lanes. It is also developing Rieselfeld as a high-density, mixed-use project which reserves three-quarters of its land as a natural area, targets 30 percent of its housing units for social housing, and is served by an electric tram line. Chula Vista seeks to provide safe, quiet, and peaceful residential neighborhoods while also ensuring that workplaces and shopping facilities are within easy driving distances. In order to sustain these qualities, it is rapidly developing the land east of Interstate 805 in a series of master-planned communities. The EastLake communities emphasize low-density, detached single-family residences; a wide range of privatized recreational opportunities; and, through effective implementation of Chula Vista's Threshold Standards Policy, increased automobility without worsening congestion. Whereas 57 percent of Freiburg's transportation takes place by public transit or bicycling, only 14 percent of Chula Vista's takes place by those modes; whereas virtually all of Rieselfeld's housing units are located in multi-family structures, most of EastLake's are located in detached single-family units; and whereas 30 percent of Rieselfeld's housing units are dedicated to social housing, 10 percent of EastLake's units are designed for similar households.

Thus Freiburg (Rieselfeld) and Chula Vista (EastLake) differ rather dramatically from one another. But is one pattern more sustainable than the other? Both cities are pursuing patterns of development that are sustainable *locally* in the sense that their citizens and officials have identified features of their cities which they admire, and are taking steps to

to sustain these features.[9] However, in their planning for EastLake, Chula Vista has sought to sustain certain transportation and land use qualities which may not be sustainable in a *global* sense. In particular, their approach to transportation planning successfully addresses local congestion problems, but the increased automobile dependence associated with their new development may work contrary to global sustainability goals. Similarly, Freiburg has characteristics of a white collar town with very expensive housing, high land costs, a high unemployment rate, and fairly high taxes. It also imports electricity from other regions to power its trams, and hence displaces a portion of its transport-related costs on distant places. Can a city with such characteristics be sustained? In both cases, Freiburg and Chula Vista, one must ask whether the local qualities of life that their citizens and officials seek to sustain can be sustained at the global scale; that is, what would happen if everyone on earth was able to experience the same qualities of life that are evident in either Freiburg or Chula Vista? To pose these questions about global sustainability is to introduce the concept of the *ecological footprint* (Wackernagel and Rees, 1996). With that concept in mind, one would ask what amount of ecologically-productive land (and water) is required on a continuous basis to provide all of the energy and material resources consumed in, and to absorb all the wastes discharged by, either Freiburg or Chula Vista.

Both Freiburg and Chula Vista have initiated significant shifts in their transportation and land use patterns over time. Until the mid-1970s, Freiburg's new development seemed to be adopting the U.S.'s lower-density, automobile-oriented pattern; moreover, it too chose to develop segregated high-rise apartment units for lower-income residents. But Rieselfeld clearly documents Frieburg's effort to turn away from both patterns and to pursue a new pattern that evokes features of the older part of the city. Chula Vista began developing the area east of Interstate 805 at a density much lower than the older area to its west, but with the near-completion of the EastLake communities, Chula Vista now seems to be trying to evoke some of the patterns that are found in the older parts of the city.

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[9] Chula Vista's rapid growth in population (roughly 5 percent per year from 1980 through 1997) makes us less confident of this assertion.

These shifts in transportation and land use patterns, in large part, may be connected to the ways in which the topic of sustainability has been argued in Freiburg and Chula Vista.

Future research should focus primarily on developing quantitative criteria that could be used to compare the sustainability of the two cities, including calculation of each city's ecological footprint. The current research has suggested that the specific criteria need to emerge through consultation and negotiations with public officials and nongovernmental organizations (NGOs) drawn from both cities. By initially focusing on new developments in Freiburg and Chula Vista, it has become apparent that two similarly advanced societies can pursue very different approaches to sustainability. Furthermore, both cities could be considered sustainable in the local sense, although once global considerations are introduced, it appears Freiburg is ahead of Chula Vista.

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Figure 1. Street Map of Freiburg

Figure 2. Map of Freiburg's Public Transportation Network

Figure 3. Chula Vista and the San Diego Region

Figure 4. East and West Chula Vista

Table 1
Modal Shares in Freiburg
(Percent of Travel by Mode)

Year	***Cars***	***Public Transit***	***Bicycle***
1976	60%	22%	18%
1989	48%	25%	27%
1996	43%	28%	29%

Source: Ungern-Sternberg (1997b)

Table 2
Population and Residential Densities
East and West Chula Vista

	West of I-805 (pre-1980)	***East of I-805 (post-1980)***
Population Density (persons/acre)	12.2	5.56
Residential Density (persons/acre)	4.88	1.85

Source: 1990 U.S. Census of Housing and Population

Table 3
Travel and Transportation System Characteristics
East and West Chula Vista

	West of I-805 (pre-1980)	***East of I-805 (post-1980)***	***San Diego County***
Percent Drive Alone	70.3%	79.7%	74.6%
Percent Transit	5.3%	1.7%	3.5%
Percent Carpool	15.4%	13.2%	14.5%
Percent Other Modes	9%	5.0%	7.4%
Mean Travel Time to Work (all modes)	21.3 minutes	22.3 minutes	23.1 minutes
Total Roadway Right-of-Way	213 miles	127 miles	7,726 miles
Major Arterial Right-of-Way	2.0 miles	18 miles	897 miles

Source: 1990 U.S. Census of Housing and Population

Table 4
Socio-Economic Characteristics
East and West Chula Vista

	West of I-805 (pre-1980)	***East of I-805 (post-1980)***	***San Diego County***
Median HH Annual Income	$29,535	$47,537	$35,022
Percent White	70.4%	68.2%	65.4%
Percent Hispanic	36.2%	28.7%	20.4%
Percent Black	5.0%	3.4%	6.0%
Percent Other Races	24.6%	28.4%	8.2%

Source: 1990 U.S. Census of Housing and Population