
WORK/LIFE COMMUNITY BY TELEWORK—POSSIBILITIES AND ISSUES IN THE CASE OF LOMA LINDA

Yoko Kawai, Ph.D.¹

ABSTRACT

This paper suggests telework, and work/life community created by it, as potential design tools for the sustainability of local communities, and investigates their possibility and issues through a case study of Loma Linda Connected Community Program (LLCCP).

A new work/life style enabled by information communication technology (ICT), often called telework, is expanding in the U.S. The environmental impact which this gives on community scale has been neglected. Yet, since telework can give the area economic advancement without huge development, make mixed-use zoning plausible, and grants sense of community, it could bring physical, economic and social sustainability to local communities.

LLCCP, as an example of emerging municipal ICT deployment programs, was examined on two levels; i.e. level of urban policy and of urban design. It was revealed that LLCCP, as an urban policy, has a good potential to create ICT-served work/life community, thus to contribute to the smart growth of the city. It does so by promoting new businesses yet small/home ones only, and developing new neighborhoods yet ICT-served work/life communities only. Its link to regional plans and to the building code which ensures the connectivity in entire city elevate its possibility.

The paper also pointed out that city's urban design strategies are not yet supporting LLCCP toward its goal. It lacks coordination with teleworkers' life style, and with spatial system for the entire city. A current design proposal overlooks teleworkers' driving habits and their specific needs to the types of retails/business-services, for example. The result implies that the use of telework in creating sustainable community may have started to be recognized on urban policy level, but that urban/architectural design for it is still behind to be developed.

KEY WORDS

sustainability, telework, information communication technology, urban policy, urban design

TELEWORK FOR SUSTAINABILITY—ON REGIONAL AND LOCAL SCALES

This paper suggests telework, and the work/life community created by it, as potential design tools for the sustainability of local communities, and investigates their possibilities and issues through a case study of the Loma Linda Connected Community Program (LLCCP).

A new work/life style enabled by information communication technology (ICT), often called telework,¹ is expanding in the US. More than 20% of the total workforce, including employed workers and small business owners, telework at or closer to home.² Technology's progress is not the only reason for this expansion. The changing workforce, the demand for an agile workplace, and the limited work/life sup-

port for families fuel this change and make it socially inevitable.³ With certainty, we will see more people work and live within the same quarters by using ICT.

On a regional scale, to the implications of telework on our environment has been discussed by some planners. Telework's effect on decreasing highway traffic and auto emission has been examined by Mokhtarian and colleagues⁴ and was the main driving force behind promoting telework, when Federal and States governments introduced telework policies⁵ in the early 1990s. Yet research results on this effect have been mixed, particularly because, if telework helps people relocate farther away from large cities, it could increase the driving hours even when the commuting frequency decreases. This possibility of population decentralization caused by telework

¹Yoko Kawai, Ph.D., Intl Associate AIA, is a principal of Penguin Environmental Design, L.L.C. in Hamden, Connecticut. Further information: www.PEDarch.com. Contact e-mail: YKawai@PEDarch.com.

also has been discussed, or argued, by some including Gould Ellen & Hempstead.⁶ Still, why has the decentralization-or-not been treated as a dominant factor that influences telework's effectiveness in maintaining sustainability? I suppose it is because the sustainability at the local community level has not been reliable (or even considered), and because sustainability's various aspects, other than ecological ones, have been overlooked.

Among architecture professionals, the focus of discussion on sustainability tends to fall only into its ecological aspects, even when the subject is a city or a community,⁷ rather than architecture. Yet as some scholars and environmental policies state, the sustainable design is made possible only when a sustainable economy and society support it.⁸ Telework, in addition to decreasing vehicular emission for the sake of ecology, is capable of contributing to these economic and social aspects of sustainability, although this fact, as well as its impact on local communities, tended to be overlooked in previous research.

Since it is not attached to a particular location, telework could redistribute jobs from metropolises to other areas. Jobs granted by it are especially important for outer suburb or rural areas, which have been economically dependent on larger cities. A greater number of jobs within a local area also translates into economic development without a large physical one, which requires investment and land. Combined with the idea of mixed-use zoning, this will allow the local community to be compact and dense, making the area more sustainable in many ways, including ecologically.

Telework also provides social capital, such as a sense of community, which supports its sustainability. It allows employed individuals to have more time for community affairs.⁹ There is also evidence that small businesses contribute not only money but also time and services to their local communities.¹⁰

Work/life style of telework, in other words, can bring self-sufficiency, hence sustainability, to local communities. At the same time, since self-sufficient local communities will decrease city-to-city traffic, it will make telework a more effective tool for the sustainable region regardless of its degree of decentralization.

LOCAL AUTHORITIES AND THEIR ICT POLICIES

While the access to broadband internet is essential for taking advantage of telework, the number of those who are subscriber to it in America is not very high (11.1% of population) compared to other developed countries.¹¹ Given this situation, local governments have recently started to implement ICT infrastructure. One-hundred-sixty-four municipalities have their own Wi-Fi networks.¹² There are 31 cities that own fiber optics or provide service through it¹³. The number of households serviced by municipal fibers is 32% of fiber-optics subscribers in the States.¹⁴

The goals of these local governments in implementing ICT networks, that is, whether or not they are pursuing sustainability, are not always clear. However, since they are the decision makers on land usage, density, building height, and street design,¹⁵

FIGURE 1. Old and New Loma Linda



in other words, our cities' design, the way in which they are using the new ICT infrastructure in relationship to urban spaces will have significant impact on the prospect of work/life community.

In the next part of this paper, a fiber optics implementation program by the City of Loma Linda, CA, is examined to determine if and how it is used to contribute to the materialization of work/life community. Its possibilities and issues were investigated on two levels, urban policy and urban design. Loma Linda was one of the first cities to deploy fiber optics and provide associated services, and the only one to include fibers into its building code. Its service started in September 2004. In addition to analyzing plans and statistics, a site visit as well as in-person and phone interviews with city officials were conducted between November 2005 and May 2006.

CITY OF LOMA LINDA

Loma Linda is, in one sense, a growing suburban city on the fringes of an expanding metropolis. It is located 65 miles east of Los Angeles, California. Its population is expected to increase by 50% within the next 25 years¹⁶ due to immigration to Southern California. The region's housing price has skyrocketed with a 25% increase in one year.¹⁷ The average pre-owned house price is \$409,000.¹⁸ It is not affordable, but is much lower than in Los Angeles,¹⁹ thus drawing more population to Loma Linda.

At the same time, Loma Linda is an affluent and self-sufficient small town. It has clear historical roots in the hospitals and the related university, with social and economical activities that are still focused around these roots. Its population, although growing, is small with 18,837 residents.²⁰ Its residents are highly educated. More than 20% have graduate or professional degrees, and more than half are employed in management or professional occupations.²¹ As a result, they earn relatively high incomes.²² Loma Linda is a job-rich city with two jobs per household, meaning that many commute to the city.²³ Seventy percent of these jobs are in the health and social service industries.²⁴

Having these two incompatible pictures, Loma Linda's challenge is to "continue to be a small . . . community,"²⁵ while encouraging growth. The term 'encouragement' is used because, not only is it unavoidable, but the municipal government must also

increase its revenue in order to provide quality services to the growing community.²⁶ In other words, Loma Linda needs smart growth.²⁷

LOMA LINDA CONNECTED COMMUNITY PROGRAM

Loma Linda Connected Community Program (LLCCP) is unique in four aspects.²⁸ First, it provides a very fast and secure connection using fiber optics, which are at least 3 times as fast as DSL. Its maximum speed is 1Gps; the nation's fastest. It chose active optical network which provides the same speed for uploading and downloading, and it deployed four underground self-healing circular backbones for a secure connection.

Second, it covers all of the city's structures. The city intends to put fiber not only into new structures, but also into existing neighborhoods, rental apartments, and commercial buildings. Although the installation into existing houses is not mandatory, except the major remodeling cases, the city will install the lines up to the connection point on the street.

Third, LLCCP is positioned as a public infrastructure. As in the case of streets, water and sewage pipes, housing developers must construct and deed the lines to the city, and the city will maintain them. Payments for fibers and other services, such as water, phone, TV and internet, are also integrated into one bill.

Fourth, its technical specification is in the municipal building code. In addition to specifying the technical standards, it instructs, for example, that the data cabinet should be in the closet of the master bedroom, and each room of the house must have at least one outlet for TV, phone, and data.

With these unique policies, LLCCP has the opportunity to achieve two major accomplishments. First, with its fast and secure connection, and with coverage of all structures, it was designed to promote work-at-home and small businesses. Second, its complete coverage of the city, its position as a public infrastructure, and its technical standard maintained by the city ensure better performance, and hence better quality of life, in this area compared with adjacent cities. Subsequently, it will raise property value. These two accomplishments help stabilize and increase municipal revenue, which will serve the growing population.

LLCCP AND LOCAL PLAN

In California, the General Plan is a city's most important statement regarding its ultimate physical, economic, and cultural environments.²⁹ In the hierarchy of plans therefore, the General Plan is above the LLCCP, and by definition the LLCCP should follow the General Plan. Yet in the case of Loma Linda, the relationship between the two goes beyond the mandatory coherence, which is possible and visible because its General Plan is currently being revised.

As a city's ICT strategy, LLCCP's role is to "allow residents and businesses to focus on application level of technology by freeing them from lower level of mere connectivity."³⁰ In addition, as a result of the LLCCP, businesses can be operated in any part of the city.

The city's most recent draft³¹ of the General Plan is clearly trying to take advantage of the LLCCP for the city's "technology advancement" and realization of "work/live Community."³² For these purposes, LLCCP is closely coordinated with the General plan. For example, the first phase of the LLCCP covers the General Plan's largest section, Special Planning Areas, where new mixed-use work/life communities are anticipated (Figure 2). In the General Plan,

home occupations of many kinds are allowed in residential areas, which help the LLCCP to promote work-at-home. Another example is seen in the General Plan's intent to encourage businesses outside the city to collocate or to move to Loma Linda for the use of fiber. It also promotes work place alternatives for the employers by using LLCCP as a tool.³³

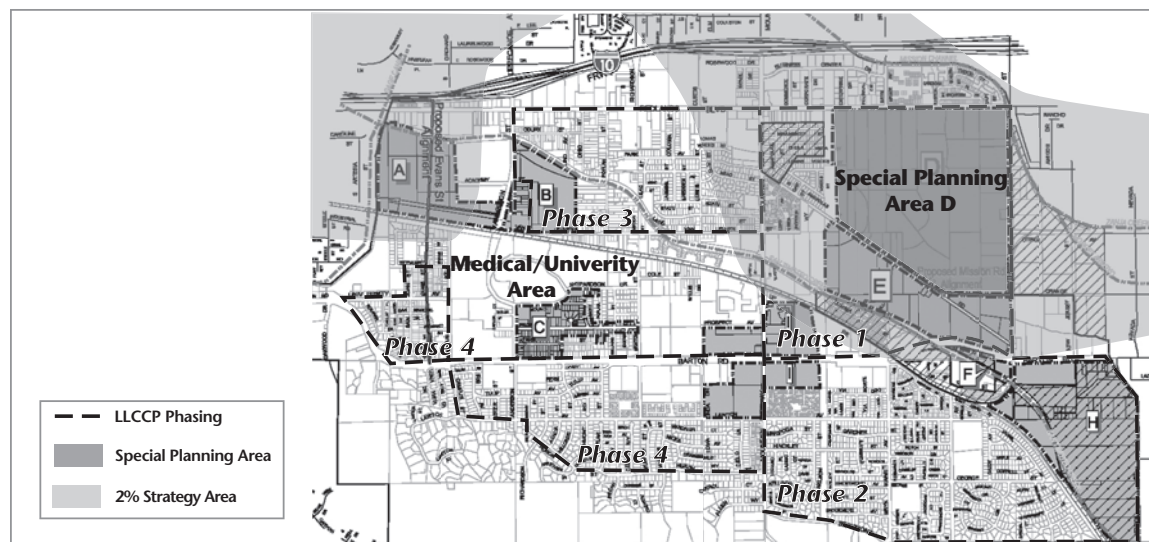
LLCCP AND THE REGIONAL PLAN

Most of the General Plan's physical elements should be coherent with plans by the Southern California Association of Government (SCAG).

Loma Linda's LLCCP and General Plan, again, do more than comply with the SCAG plans. In response to the region's rapid growth, SCAG started a growth visioning process called "COMPASS" in 2003.³⁴ One of the plans that evolved from COMPASS is "the 2% Strategy". The idea behind it is that by concentrating the growth in just 2% of SCAG's region, the rest of the region can be spared from the negative effects of the growth.³⁵ Loma Linda is one of the municipalities which takes part in "the 2% Strategy", and is asked to accept a certain number of growing population by building new houses.³⁶

As such, Loma Linda considers that, if it must follow this requirement and wishes to, at the same

FIGURE 2. Layers of Plan for Loma Linda



time, control the growth, “Work/Live concept” in the “land-efficient development” is the strategy it has to adopt. Through LLCCP and the General Plan, the city provides a “platform that can integrate different types of houses” to “control the private developers,” according to the city directors.³⁷ Once again, the majority of the 2% strategy area in Loma Linda matches special planning areas of the General Plan and the first phase of the LLCCP, where the mixed-use development is detailed (Figure 2).

LLCCP AS AN URBAN POLICY

As discussed, Loma Linda’s goal is smart growth. The above discussion reveals that the LLCCP could promote the growth, while simultaneously preserving smallness. It does so by promoting new businesses yet small/home businesses only, and developing new neighborhoods but solely ICT-served work/live communities. Its coordination with higher ranking plans increases its possibilities. As an urban policy for the city’s smart growth, the LLCCP has a good prospect.

URBAN DESIGN AND LLCCP

What about its prospect as a program that heavily influences the city’s spatial aspect? In order for Loma Linda to create an ICT-served work/life community which is sustainable, there are at least two design issues to be addressed.

First, space inside new developments must correspond to the new work/life style of teleworkers. It has been pointed out that teleworkers have unique needs for their urban and residential environment. If new developments are not attractive for these individuals, the city cannot retain them as residents, nor maintain the space as designed.

Second, each new development should be positioned as a part of a larger spatial system, which makes the entire city self-sufficient and small. In a new development, residents may spend a relatively long time at home. Yet unless it has a spatial system and programs to encourage them to stay inside the municipal boundary for business transactions and private errands, a new development becomes another suburban one that relies on the larger cities.

In the following sections, I examine Special Planning Area D in Loma Linda to determine whether the above two design goals are met. Area D is des-

ignated in the General Plan as a mixed-use development area, a large part of Phase 1 of the LLCCP, and included in the 2% Strategy Area of the SCAG. It is here that the city is trying to realize work/life community by taking advantage of the LLCCP. First, the teleworkers’ lifestyle is described and its impact on urban/residential spaces, followed by the current plan of Area D. A comparison will be performed and alternatives will be suggested, where needed.

TELEWORKERS’ LIFESTYLE AND THEIR URBAN & RESIDENTIAL SPACES

Transportation

Against the popular image of teleworkers staying at home the whole day, they often drive. Patterns of driving habits are different between the two types of teleworkers.

Employed teleworkers commute often to their main office. In Southern California, only 9.3% recognize themselves as full-time teleworkers. When commuting, nearly 80% drive alone, and for longer distances than non-teleworkers³⁸. Mokhtarian & Henderson (1998) found that, when teleworkers work at home, they make daily trips as often as non-teleworkers. However, their use of highways is less frequent and the purpose of their trips tends to be more private.³⁹

Home business owners stay at home longer than employed teleworkers; 59.9% work at home almost every day. However, 21.9% also work at clients’ offices at least once per week.⁴⁰ They take more trips per day than non-teleworkers, mostly for business purposes, although their use of highways is to a lesser degree.⁴¹

Facilities They Use

Within their neighborhoods, teleworkers use specific types of retail/commercial services both for their businesses and private lives. The time frame of the day during which they use these facilities varies widely.

It is true that many employed teleworkers use their time they used to spend for commuting for their families (49.2%) and for exercises (30.2%) as discovered by Kawai & Shiozaki (2004).⁴² However, the same research also revealed that 19% do errands and 9.5% work more during that time. Accordingly, their neighborhood reliance in purchasing goods and services increased, yet their degrees

vary depending on trades. More than 15% changed the location for groceries, book and gift shopping, and postal services to their neighborhood, but very few did so for clothes shopping, doctors or banking.

For many home business owners, work-at-home is only one alternative for job location.⁴³ There is a large demand for small offices in residential neighborhoods to facilitate the move of offices from both home and urban settings.⁴⁴ The lack of meeting spaces in home offices creates another demand. In spite of their reliance on ICT, teleworkers value face-to-face conversations for the business, as discovered by Beyers (2000),⁴⁵ which explains why coffee shops and printing/delivery shops with conference space are expanding into the suburbs.⁴⁶

Teleworkers use their time in various flexible ways. Examples in Pink (2001)⁴⁷ and Sandlund (2001)⁴⁸ show that some work late at night, while others run errands at odd hours of the day. This flexibility is to such a degree as to create a pressure between their private and professional beings.⁴⁹

Their Houses

Employed teleworkers and home business owners have different needs for their homes.

As in Kawai & Shiozaki (2004),⁵⁰ in spite of their average-sizes houses, 88.9% of employed teleworkers have a dedicated work space and 58.9% has an independent office, most of the latter are have been diverted from extra bedrooms. However, many of their work space/rooms lack typical office furniture, which teleworkers do not mind or even enjoy.

On the other hand, teleworkers who spend long periods of time at home, many of whom are home business owners, need a boundary between private and public spaces.⁵¹ This requires an office that is separated from the rest of the house. Their needs for the office also change depending on the phase of their business.

Their Socioeconomic Background and Neighborhood Preference

Teleworkers' socioeconomic background is not very diverse yet. In Southern California, 61% of employed teleworkers have a bachelor's degree and 26.8% earns more than \$100,000 annually.⁵² 50.6% of teleworkers in the States are in managerial/professional occupation and 26.7% are in clerical positions.

It is undeniable that a neighborhood and its residents' social class are closely connected in the US. "Individuals prefer to live near others like themselves" as Ionides and Zabel (2003)⁵³ concluded. If we apply this to teleworkers, their neighborhoods would most likely lack diversity.⁵⁴ Home business owners' tendency to seek interpersonal relationships even where their business is located, as Mugerauer (2000) reveals,⁵⁵ also implies of the same tendency.

CURRENT PLAN FOR AREA D

Transportation & Land Use of the City

Transportation in Loma Linda relies mostly on cars, with minimal support by buses. There is only one bus route between Area D and the medical/university facilities. A candidate site for the planned railway station is situated nearby.⁵⁶ Still, Loma Linda has not responded to this possibility by rearranging its traffic plan.

The city measures only about 2 by 3 miles. Its land use consists of three east-west strips. The north strip is for commercial use, while the south one is for residential. Medical/university facilities, which provide most of the jobs, are on the west side of the central strip, and Area D is on its east side.

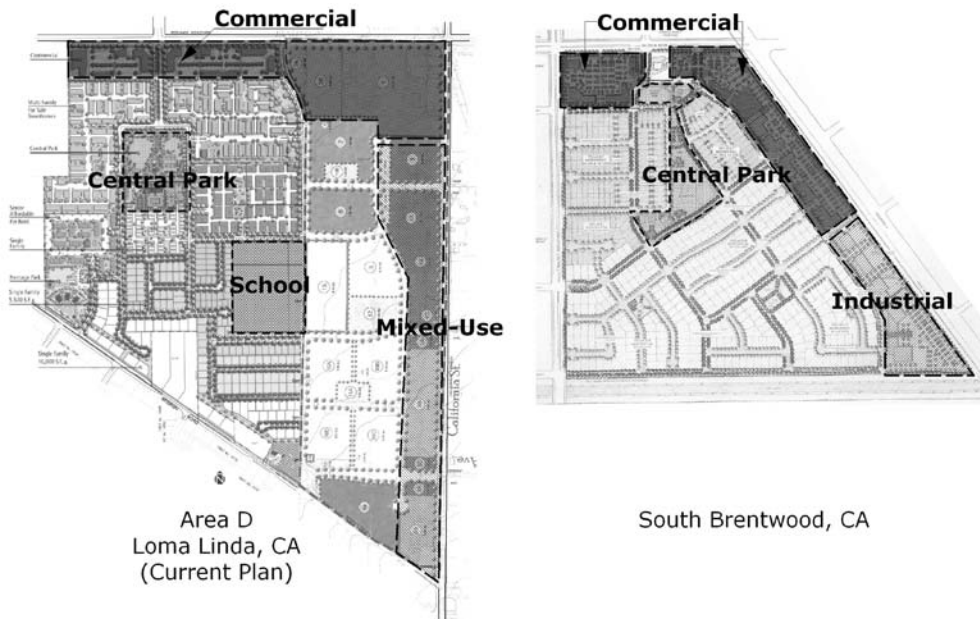
Retail stores in Loma Linda are scarce. There are only 35 retail establishments.⁵⁷ There are five grocery stores, six pharmacies, and six restaurants/fast-food-shops, most of which are close to medical/university facilities.⁵⁸

Site Plans and Facilities

With the help of Peter Calthorpe, a leader in New Urbanism, the city has been directing two developments in Area D (Figure 3). A commercial zone and a mixed-use zone for retail/commercial/residential facilities are along two busy streets which form outer edges of the area. Many shops are large⁵⁹ with no trade designation, while in the inner part of the area, a park and a school are surrounded by residential zones with relatively high density.⁶⁰ Streets within the residential zones are lined with side walks and trees to realize "smart development" through a "walkable community."⁶¹

Also shown in Figure 3 is a plan for South Brentwood,⁶² CA, designed by Calthorpe using the New Urbanism method but lacking ICT infrastructure.

FIGURE 3. Developments With/Without Fiber Optics



There is hardly any difference from Area D planned in Loma Linda. Large retails are located in outer areas along roads, while various types of residential houses surround a park in the center. Streets in the residential zone have side walks with trees. Both plans can be categorized as Traditional Neighborhood Development.

Houses and Streets

Thus far, no spatial uniqueness can be observed in the houses of Special Planning Areas. Figure 4 shows the floor plan of a house that is already on the market in Area E, which is a new mixed-use area adjacent to Area D. The living and dining rooms as well as the kitchen are on the first floor, while the bedrooms are located on the second floor. This is prototypical of American small houses, and shows no trace of fiber. One of two developments in Area D is required to follow guidelines for historical design language, Victorian and Craftsman. Yet there are no guidelines for floor plans or the houses' spatial relationship to the streetscape.

Mixture of Housing Types

Area D attempts to provide many types of houses in order to diversify the community. It has 310 apart-

ments, 804 condominiums, 417 mixed-use structures, 224 senior housing units, and 601 single family houses of various sizes.

ANALYSIS AND ALTERNATIVE Transportation and Land Use of the City

The current plan for Area D envisions a walkable community within, yet with insufficient public transportation outside. This is contrary to the notion that teleworkers often drive away from home for their jobs/businesses. The current design will increase the traffic, just as other suburban developments will.

The alternative for Loma Linda to have a work/life community that does not jeopardize its goal of smart growth would be to incorporate semi-public transportations, shuttle buses, and car-pooling programs, between Area D and the university/medical facilities.

Site Plan and Facilities

The current site plan poses two problems. First, it envisions large road-side retails with unspecified trades. This does not agree with the teleworkers' needs toward specific types of retails/services. Second, the side walks do not link the houses with the

facilities they need most. In the current plan, residents might walk to parks/schools; however, since they are full-time workers, primary pedestrian circulations should be on their way to jobs/businesses.

One suggestion proposed here is to introduce facilities targeted for teleworkers. In addition to a school and parks in place, particular types of retails/services, including a grocery store, a book shop, and a post office should be introduced. Small offices, rental conference rooms and other business support services should also be encouraged to settle in Loma Linda. It is also desirable that they will maintain longer working hours to accommodate teleworkers' flexible life style.

Second, these facilities should be spatially combined with semi-public transportation and located at the center of Area D (Figure 5). Surrounded by houses, this configuration will generate pedestrian traffic to and from the jobs/businesses and make Area D "walkable", as intended. This is similar to the

Transit Oriented Development by New Urbanists, yet the transportation method and retail specifications are unique here. It should be also mentioned that, if semi-public transportations are well-developed, not many retails/services are necessary in Area D. As it is a small city, commercial developments in other parts of the city can serve Area D.

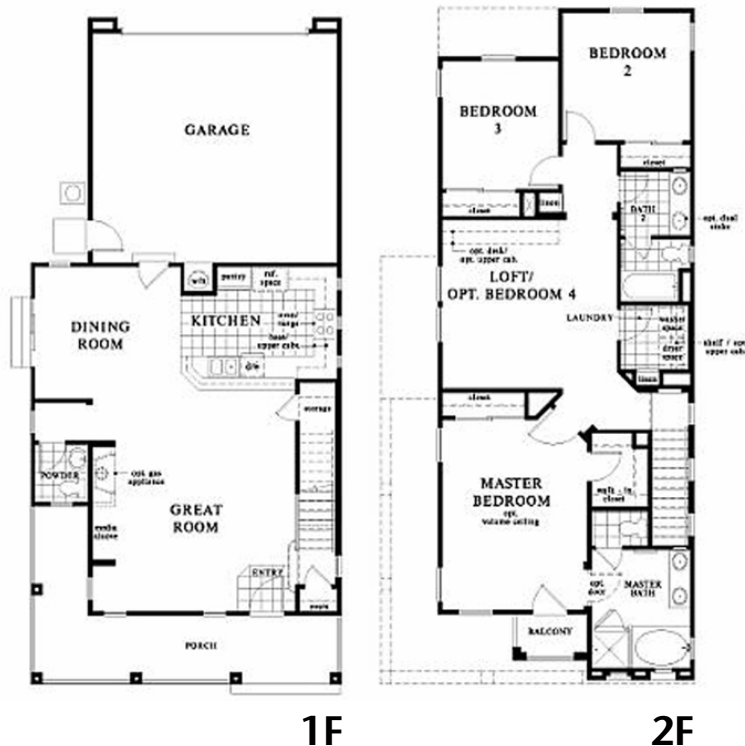
Houses

Teleworkers' unique needs for their houses, as well as the differences between the two types of teleworkers, are not incorporated into the current design.

In the alternative design for employed teleworkers, floor plans should be open and flexible to promote a relaxing work environment.

For home business owners, an independent office is necessary. It should be separated from the home's private area and have its own entrance. A small business often changes in size, and therefore, an office should be easily expanded or be diverted for other uses.

FIGURE 4. A House with Fiber Optics



A Mixture of Housing Types

The current plan for Area D intends to diversify the community. However, this ideology contradicts the relatively monotonous socioeconomic background of teleworkers, and of current Loma Linda residents.

One of the alternatives is to accept the residents' relative monotony, and create a community which will grow steadily. Various housing types in the current plan might not invite people from many social groups. However, with some policy support, they could attract those in the same group but during different stages of their lives. Apartments and condominiums could be offered to graduate students and retired professionals, who are telework candidates and whose population is large in Loma Linda.⁶³ For this to happen, semi-public transportation is crucial. Here it is also suggested the introduction of a housing policy that will support the residents in moving between different housing types within Area D, leading to a stable community and allows for the growth of the business within Loma Linda.

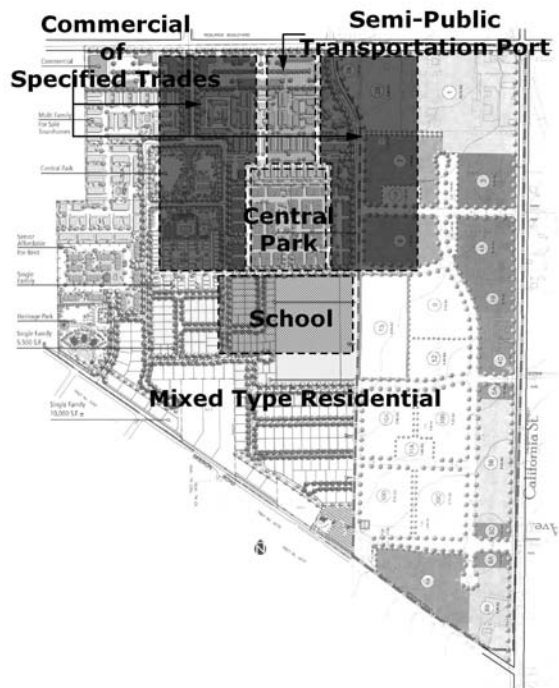
POSSIBILITIES/ISSUES FOR THE LOCAL COMMUNITY AND REGION

This paper, following the potential of telework, and the work/life community created by it, examined the case of the Loma Linda Connected Community Program, as design tools for a sustainable local community.

It revealed that the LLCCP, as a local urban policy, has a solid potential for creating an ICT-served work/life community, thus contributing to the city's smart growth and sustainability. Its link to the building code, which ensures connectivity in the entire city, and to local and regional plans, which regulate the density and land-use, were the key factors. In other words, the LLCCP's potential success lies in the coordination between the soft urban policy, creating jobs and communities in a social sense through ICT, and the hard one, that is, regulating physical space. The former was lacking in previous self-sufficient community planning, such as new towns and New Urbanism.⁶⁴

The paper also points out that city's urban design strategies do not yet support the LLCCP in creating an ICT-served work/life community. It lacks coordination on two levels: with the teleworkers' life style in new developments, and with the entire city's

FIGURE 5. Alternative Plan for Area D



spatial arrangement. Besides the need for strategically designing teleworker-targeted residential and commercial/retail areas as a solution for the former, the paper suggests that their cores should be better networked with the existing part of the city, both in terms of function and transportation, to make it self-sufficient. This network becomes all the more useful with future telework communities in existing neighborhoods, which are made possible by Loma Linda's installation of fiber optics throughout the city.

The result implies that the use of telework in creating a sustainable community has a potential and may have been recognized at the urban policy level. It also shows that the urban/architectural design for it is still need to be developed. In the case of Loma Linda, the outcome of a seemingly promising urban policy and the consequences of a problematic urban design are too early to be judged.⁶⁵

Finally, what would be the possibilities and issues for the sustainability of larger regions, if methods like the LLCCP are proven to be successful in making self-sufficient work/life communities? The possibility exists that the multi-polarization of jobs/

housings will occur, which will reduce city-to-city traffic congestions and vehicle emissions. The question of placing the poles should be addressed by coordinating local and regional plans as was done in the case of Loma Linda.

The LLCCP targeted highly educated and well-resourced people who are also the largest socioeconomic group of a not yet very diverse population of teleworkers. If this group of people will remain as the only target for this “work/life community by telework” planning strategy, then the issue will lead to a social divide. Only the wealthy communities will afford this strategy and become wealthier and healthier, which will create economic, social, and ecological imbalances on a regional scale. There are some indications against the development of this scenario, although continuing observation is necessary. Increasing the teleworking population, especially under socially inevitable grounds as previously mentioned, is likely to bring more diversity among teleworkers. Research also suggests that the teleworkers’ preference for neighborhood profiles may differ among the different socioeconomic groups,⁶⁶ which will award a wider range of communities the chance to try their own work/life community strategies.

The design aspects reviewed here are not numerous, due to the limited data available on teleworkers’ life. The next step for our profession, as architects, is to develop a design scheme for an ICT-served work/life community by broadening our views. Now is the time to design work/life communities for those who work in front of computers, as many people these days do, not for craftsmen and shop-keepers, as some architects/planners dream, if we want to take advantage of ICT for sustainable communities.

ACKNOWLEDGEMENTS

The author is grateful to Yumiko Horita (Wakayama University) for her constructive comments on an earlier draft.

NOTES

1. Definition of telework varies depending on the circumstances in which it is discussed. For this study, I apply the definition of “work independent of location enabled by telecommuting technology”.
2. As of 2002. Joanne H. Pratt, *Teleworking Comes of Age with Broadband-Telework America Survey 2002*. International Telework Association, 2003.

3. Yoko Kawai, “Impacts of Telework on Urban and Residential Environment in the United States” (PhD diss. Kobe University, 2005), 42–65.
4. The discussion is summarized in Patricia L. Mokhtarian, “Telecommuting and Travel—The Case for Complementarity,” *Journal of Industrial Ecology* 6, no. 2 (2002):43–57. Others include Choo, Mokhtarian & Salomon (2005), Mokhtarian, Salomon & Choo (2005), Mokhtarian & Henderson (1998), and Henderson, Koenig & Mokhtarian (1996).
5. One of the early efforts by the federal government to increase teleworkers was in *Presidential Global Climate Change Action* (1993) where telecommuting was identified as a technique to help meet environmental goals.
6. Gould Ellen and Katherine Hempstead, in their “Telecommuting and the Demand for Urban Living: A Preliminary Look at White-collar Workers”, *Urban Studies*, 39, no.4, (2002):749–766, argued that there is no evidence of decentralization among white-collar teleworkers.
7. For example, in the most recent report for the LEED-ND Core Committee (“Understanding the Relationship Between Public Health and the Built Environment.”(2006)), in spite of its effort to cover the relatively wide range of subjects related to sustainability, the large part of its discussion and data is on air quality and vehicle emissions.
8. Kent E. Portney, *Taking Sustainable Seriously* (Cambridge: MIT Press, 2003). Stephen R. Kellert, *Building for Life* (Washington: Island Press, 2005).
9. Robert D. Putnam, *Bowling Alone*, (New York: Simon & Schuster, 2000), 213.
10. Princeton Survey Research Associates, BBB Wise Giving Alliance Small Business Giving Survey—Final Report (2001).
11. International Telecommunications Union, “Broadband Subscribers per 100 inhabitants”, January 2005.
12. As of December 2006. Data retrieved from www.muniwireless.com on Sept. 7, 2007.
13. Fiber To The Home council, 2006.
14. Sharon E. Gillett, William E. Lehr, and Carlos A. Osorio. “The Municipal Role in U.S. FTTH Market Growth”, (paper prepared for the FTTH Council’s 3rd Annual FTTH Conference & Expo, Orlando, Florida, October 4–6, 2004).
15. Agenda 21 of *Our Common Future* (1987) by WECED emphasizes the importance of involvement by local governments.
16. City of Loma Linda, *City of Loma Linda Draft General Plan* (October 2005), 2–39.
17. National Association of Realtors (2005).
18. Data from www.Realtor.com based on the data over a rolling six months period, as of April 11, 2006.
19. \$553,200 in Los Angeles—Long Beach MSA. National Association of Realtors (2005).
20. City of Loma Linda (2005), 2-39.
21. U.S. Census Bureau, Census 2000.
22. Southern California Association of Governments (SCAG), *Regional Housing Assessments* (1999).
23. City of Loma Linda (2005), 4-4.

24. Calculated by the author based on the 2002 Economic Census from the U.S. Census Bureau and 2004 Job projection list by SANBAG.
25. City of Loma Linda (2005), 1–10.
26. Loma Linda's revenue is steadily increasing, yet it will need more funding because of the expected growth. According to Agajianian & Associates, *Fiscal Sustainability Report* (2001), the city faces two issues. First, almost every retail category is not well represented in the city. The second issue is that too many property-tax exempt parcels are found in the city. Although the university and hospital are the core of economic activity, their vast properties are tax-exempt, which limits the prospect of increasing revenue.
27. Loma Linda's official documents have never used the exact term, except for the use of "smart development". The term's definition varies among the advocacy groups. The author has judged Loma Linda's goal as smart growth based on the definition in *Getting to Smart Growth* by International City/County Management Association. "Smart growth is development that serves the economy, community, and environment. It provides a framework for communities to make informed decisions about how and where they grow. Smart growth makes it possible for communities to grow in the ways that support economic development and jobs; create strong neighborhoods with a range of housing, commercial, and transportation options; and achieve healthy communities that provide families with a clean environment."
28. The description of this section is based on three resources; City of Loma Linda, Ordinance No. 629; City of Loma Linda, "The City of Loma Linda Connected Community Program and Design, Installation and Product Specification," (August 2005), and James Hettrick, "City of Loma Linda Connected Community Program, Fiber It's What You Need for Speed," Power Point presentation.
29. City of Loma Linda (2005), 1–12.
30. Phone interview (May 11, 2006) with city officials; Director of Information Systems and of Community Development Department
31. June 2006 Draft was not available at the time of this research, and the description here is based on the interview with the Community Development Department Director (May 11, 2006) in which she referred to the coming draft.
32. Phone interview (May 11, 2006) with city officials.
33. City of Loma Linda (2005), 2-22, 2-4, 4-9, 4-11.
34. SCAG, SCAG Growth Vision Interim Report (2004)
35. SCAG, *The 2% Strategy* (2006).
36. SCAG, Housing Element Compliance and Building Permit Issuance in the SCAG Region (2005).
37. Phone interview (May 11, 2006) with city officials.
38. 7% of employed teleworkers drive more than 50 miles one way. SCAG, *2002 Telework Study Final Report* (June 2003), 17–20.
39. Patricia L. Mokhtarian and Dennis K. Henderson, "Analyzing the Travel Behavior of Home-Based Workers in the 1991 CALTRANS Statewide Travel Survey," *Journal of Transportation and Statistics*. Volume I, Number 3 (October 1998): 25–41.
40. SCAG (2003), 17–20.
41. Mokhtarian and Henderson (1998).
42. Yoko Kawai and Yoshimitsu Shiozaki, "Physical Environment of Connecticut State Government Teleworkers," *Journal of Asian Architecture and Building Engineering* 3, no. 2 (November 2004): 327–334.
43. Small businesses tend to move their location more often than large businesses in order to meet their growth for better facilities, for location efficiency etc. (2006 CIT Small Business Outlook Survey)
44. As a result, small office condominiums have rapidly developed in the suburbs. For example, an Arizona-based company sold 1.2 million sqft of small office condominiums in 2003 (Riggs 2004). In Dulles, VA, 1 million sqft small office condominiums were built between 1999 and 2003 (Mattson-Teig 2004).
45. William B. Beyers, "Cyberspace or Human Space – With Cities in the Age of Telecommunications?" *Cities in Telecommunication Age*. ed. Wheeler, Aoyama, and Warf. (New York: Routledge, 2000), 161–180.
46. FedEx acquired Kinko's copy center and has 1200 locations in the U.S. It has been trying to be "office away from the office". (Bill Birnbaum, "An Acquisition That Makes Sense: FedEx to Acquire Kiko's," *Business Strategies News Letter*. January–March 2004)
47. Daniel H. Pink, *Free Agent Nation—How America's New Independent Workers are Transforming the Way We Live* (Clayton:Warner Books, 2001).
48. Chris Sandlund, "Telework Exposed," *Home Office Computing* (March 2001).
49. Examples are presented in: Pascal Peters, "Home-based Telework: A Gendered Strategy to Cope with Demanding Work and Family Responsibilities," International Telework Workshop 2005. and Katy Marsh, "Home-Based Teleworkers' Constructions of Professional and Parental Identity," International Telework Workshop 2006.
50. Kawai & Shiozaki (2004), 327–334.
51. Janet W. Salaff, "Where Home is the Office: The New Form of Flexible Work".
52. SCAG (2003).
53. Yannis M. Ioannidas and Jeffrey E. Zabel, "Interactions, Neighborhood Selection and Housing Demand," *Economic Studies*, number 02-19, U.S. Census Bureau.
54. The author does not deny the possibility that there may be a discrepancy between favorable neighborhoods for two major telework occupations, i.e. managerial/professional and clerical. Yet this difference would not create the diversity in one community.
55. Robert Mugerauer, "Milieu Preferences Among High-technology Companies," *Cities in the Telecommunications Age*. ed. Wheeler, Aoyama, and Warf. (New York: Routledge, 2000), 219–227.
56. As of August 2006, a railroad between San Bernardino and Redland was being planned by the San Bernardino Associated Government. A candidate station mentioned here is in the vicinity of Redland.
57. U.S. Census Bureau, Selected Statistics by Economic Sector (2002).

58. Yellow Book, Loma Linda .
59. around 20,000 sqft each.
60. 10 to 24 units per acre.
61. www.orchard-park.info (accessed July 25, 2006).
62. South Brentwood was designed in 1991. Peter Katz, *The New Urbanism* (New York: McGrawHill, 1994), 46–51.
63. 33.2% of the residents are in the age cohort 25–44, and 15.4% are 65 and older. U.S. Census Bureau. Census 2000.
64. New Urbanism has been trying to realize similar self-sufficiency through physical planning, but a job/housing balance, as opposed to bedroom suburb, is not well accepted by public officials (Ajay M. Garde, “New Urbanism as Sustainable Growth?” *Journal of Planning Education and Research* 24, no. 2 (2004): 154–170), presumably because this will change the character of the concerned areas.
65. After the deployment of fibers, the city of Loma Linda has been experiencing an increase in revenue from property tax. Its expenditure, although also increased, is well balanced with the revenue increase unlike in similar municipalities in the area. This may suggest that the city is not sprawling.
66. Yoko Kawai, “Neighborhood Profiles of Teleworkers’ Residential Area—A Case Study of Connecticut State Teleworkers,” *Journal of City Planning Institute of Japan* No. 40-2 (2005:71–79).