# The Impact of Mobile Communication on Land Use Planning

**Juha TALVITIE, Finland**

**Key words:** information society, information and communication technology, wireless communications tools, services for wireless communication, spatial impact of mobile communications, regional and urban planning.

## SUMMARY

During 2002 the number of global mobile phone subscribers rose to over one billion and the figure is expected to reach 1.5 billion during 2005. In many developed countries the penetration of mobile phones is over 80 %. The development of the tools of mobile communication is intense. Wireless multimedia communication in any place at any time is an often used slogan. At the same time the development of services to be used by mobile communication tools is also rapid.

These developments have given and will give people and organisations new possibilities not only to communicate with each other but also to act in new ways. Because mobile communication is a rather new phenomenon empirical findings of new development trends are rare. Mostly there are opinions and expectations about possible impact. One aspect of this development has been rarely discussed and it is: will mobile communication affect urban and rural development and thus also land use planning of these areas.

The paper will discuss the possible impact of mobile communication on regional and urban planning based mostly on the results of my research " Information and Communication Technology: A New Aspect in Urban and Regional Planning".

Spatial impact of mobile communications is both direct and indirect. Therefore it is only an academic question to discuss them from the point of view of urban and regional planning. It is more relevant to discuss what spatial impact the whole of ICT will have on planning.

The main conclusions of the paper are as follows:

- the development of ICT-infrastructure should be included as an essential part to planning,
- the study of spatial impact of ICT should be included in the planning process,
- there are good opportunities for gaining new insights into planning,
- the programmes of planning education and training should be updated,
- the content of planning legislation and guidelines should be updated.

# The Impact of Mobile Communication on Land Use Planning

**Juha TALVITIE, Finland**

## 1. INTRODUCTION

Wireless multimedia communication in any place at any time is a common slogan used today when speaking about mobile communication. Mobile phones and GPS-devices are probably the most common tools used by a large number of people for mobile communication. These tools are important parts of modern information and communication technology (ICT).

When discussing the possible impact of mobile communication on land use planning it is essential to notice that ICT as a whole has played and will play an important role in the development of the information society. Many scientists have argued that ICT has also diversified impact on spatial development and therefore this impact should be taken into account in urban and regional planning.

My own findings in a recent research (Talvitie 2003) on the spatial impact of ICT and on the opinions of Finnish urban and regional planners in this matter support the view that ICT should be seen as a new aspect to be taken into account in urban and regional (land use) planning.

Because mobile communication has become common during the last ten years in developed countries, it is interesting to discuss possible impact of mobile communications on spatial development and thus also on land use planning although they present only a part of these consequences ICT will generally cause.

In this article mobile communication is considered to be wireless communication.

## 2. THE DEVELOPMENT OF WIRELESS COMMUNICATIONS TECHNOLOGY

Mobile phones alone or with portable computers and GPS-devices are the most common tools for mobile communications.

The development of mobile phones began in 1981 when the NMT 450 service was introduced in Nordic countries. (NMT = Nordic Mobile Telephone.) NMT 900 gave better service for wider number of users. The NMT- network was the first multinational system. NMT- phones represented the first generation, 1G, of mobile phones. It was an analogical system and capable of transmitting only voice. In many countries NMT- networks were built so that the use of NMT- phones was possible everywhere.

The GSM (Global System for Mobile Communications) system represents the second generation, 2G, of mobile phones. GSM was introduced in 1991 and it is a digital system and can transmit voice and data. GSM -phones needed their own network and gradually the GSM-networks covered nearly the same areas as NMT -networks. Nowadays the NMT- services

have been discontinued in many countries because customers have started the use GSM-phones. New technology will replace old technology.

2001 saw the introduction of the 2.5G mobile phones which represent an interim phase before the 3G mobile phones. 2.5G models include GPRS (General Packet Radio Service) technology which allows high-speed data transmission. These models can transmit voice, data, pictures and video with some restrictions. A digital camera is included in some models.

The UMTS (Universal Mobile Telecommunications System) represents the 3G mobile phones. Some 3G models were introduced in 2002. They are more sophisticated than 2.5G models, but the use of these new models with all new features depends on special UMTS-networks operators have to build. The permission to build these networks is dependent in many countries on special licences operators have had to buy with big money. It is estimated that UMTS -networks will be built at first in the most densely populated areas where there would be enough customers to use and buy the new services.

The number of global mobile phone subscribers has grown very rapidly. It has been estimated that in 1990 there were 11 million subscribers, in 1998 318 million, in 1999 480 million and in 2000 the figure was 721 million subscribers. According to the estimates of Nokia (http://www.nokia.com) in 2002 the figure rose to over one billion and will reach 1.5 billion during 2005.

In different countries there are also different phone technologies in use which means that all mobile phones do not function everywhere. This problem can be avoided by using phones which will work all over the world.

In the market there are a great variety of mobile phones. Some are targeted at young people and are cheaper than phones with more diversified functions which are targeted at business people. Also some phones have better possibilities for handling texts, like Nokia´s communicator, which makes it possible to send and receive emails etc. A combination of mobile phone and portable computer forms a good work station where the user can be connected to the network.

Mobile phones have been developed into multimedia tools. In the beginning analogical NMT-phones were used only for voice calls. Digital GSM-phones made it possible to send also data and text. In 1994 the SMS (Short Message Service) was developed. With a GSM-phone it was possible to send a short written message to another GSM-phone. This service became a great success to users and operators. According to an estimate in 2001 200 billion text messages were sent in the GSM-networks all over the world. The 2.5G phones have made it possible to send also messages which include text, voice, picture and short video. These messages are called MMS- messages (Multimedia Messaging Service).

The UMTS-networks will allow better possibilities for MMS as well to other developed services. Because operators in many countries had to pay high prices for licences to build the necessary networks it seems now that this development will advance slowly.

In any case the penetration of mobile phone users is very high in developed countries. Global penetration in 2001 was about 15 %. In a number of European countries the penetration has exceeded 80 %, in the United States 45 % and over 10 % in China.

GPS -devices (Global Positioning System) make positioning everywhere in the world possible with satellites. The first satellite was launch in 1978 by the U.S. Army. The last satellites of this system of 24 satellites were launched between 1988-1994. GPS has made it much easier to do all kinds of surveying measurements. GPS is used also in navigation both in sea, air and land. It can be used also for a number of other services in human life. The European Union has also decided to build up its own GPS-system called Galileo. Mobile phone networks are used nowadays more and more also for positioning purposes, like locating people who carry a mobile phone which is in on position.

Molitor (2001) predicted in 2001 that information and communication technology will develop very fast during the coming five years. Satellite communications and wireless and mobile communications devices are among those technologies were rapid changes will take place.

As a whole the developed mobile communications technologies have, within a decade, given mankind tools for mobile communication and these tools have been applied rapidly by a large number of people. The pace of these developments continues to be high.

## 3. THE DEVELOPMENT OF SERVICES FOR WIRELESS COMMUNICATION

Buying a mobile phone does not open possibilities to wireless communication. The phone owner has also to buy a licence from an operator who provides services for mobile phone users and allows access to its telecommunications network. One has also to pay for the use of the phone in the network just like with fixed connections. Operators have normally made agreements with other operators in different countries that the phone owner can use the phone in those countries as well as presupposing that the technology of the phone fits the local system.

The versatile use of mobile phones depends on the services the operators provide. Some of these are provided directly by operators, like the possibility to send SMS or MMS messages. Some services are provided by special firms who have made agreements with operators that the services can be used via the telecommunication networks concerned.

These new services are developing very fast. One can order the latest news or weather forecasts to his/her phone, send a query about the nearest restaurant, service station, bank etc. Or one can ask how to travel to another place by using public transport, the reply will include the route and schedule information. Only imagination will limit the development of these services and of course the costs that customers are willing to pay for them.

Internet access is also possible with modern mobile phones. The small size of the screen will limit this use. By using a mobile phone with a portable computer Internet access will be better. The speed of the connection depends on the quality of the mobile phone.

Wireless communication can be mobile communication where one can be connected to a mobile phone network. For example in Finland GSM-services are available nearly in all corners of the country except in very few geographically difficult places. What will be the regional service standard of the upcoming UMTS-networks will be seen in near future. Most likely the UMTS-networks will not cover all urban and rural areas but will concentrate to serve densely populated areas. It is good to notice that this year some airliners will provide airborne Internet access. So one could be connected all the time nearly everywhere.

The use of GSM-networks and 2.5G mobile phones at the moment provide good accesses nearly to all versatile services which operators and Internet offer. By using a mobile phone with a portable computer especially Internet connection will be better. UMTS will increase the speed to transmit information and communication will be more practical. Mobile communications tools will provide today nearly the same service standard to use Internet services as fixed line connections but offer easier access to "mobile services" than fixed connections. It is easy to foresee that service providers will continue to offer new kinds of services to be used by wireless communications tools. We are in a situation which changes very rapidly (Rainio 2001).

The use of GPS for surveying is an old story. Also its use in transportation and sea going is well known. The use of GPS for activities of ordinary people is increasing. One can mark good fishing places or places which are good for picking mushrooms or berries. GPS-devices are also built in mobile phones, watches and compasses. One can expect new combinations in the future. All these devices can help people in their normal work and leisure activities.

## 4. SPATIAL IMPACT OF MOBILE COMMUNICATIONS

In principle there are two kinds of spatial impacts of mobile communications. Mobile communication needs its own technical infrastructure and mobile communication will affect the activities of organisations and people. These two aspects are discussed below.

### 4.1 Spatial Impact of Technical Infrastructure for Wireless/Mobile Communication

The infrastructure for wireless/mobile communication is part of the whole ICT-infrastructure of operators. It is a very sophisticated system. There are exchange centres, underground fixed networks, base station masts and base stations on roofs, air cables and poles, satellites and underwater cables connecting continents and much more.

There are two kinds of spatial impact of the ICT technical infrastructure. The first is the location of the elements in the infrastructure. Most parts are not visible, they are either inside buildings or underground facilities and underground and underwater cables. The visible parts consist of base stations, poles and cables in the air.

The second type of spatial impact of infrastructure is the spatial service standard it provides. In the case of mobile communication this is a crucial point. One has to be in the area which is served by a base station. Also the quality of telecommunications networks is important as

well the quality of the mobile phone to be used. There are and will be also in the future differences is spatial service standard in the infrastructure for mobile communications.

### 4.2 Spatial Impact of the Use of Mobile Communications

Many scientists have suggested that ICT as a whole has diversified spatial impact because the meaning of space, place, time and distance as the determinants of location factors will change ( Talvitie 2002). The role of mobile (wireless) communication in this process has not been discussed very much. Kopomaa (2000) suggests that the place where one uses a mobile phone should be called "a third place". Probably the mobile phone users cause clearly the best known impact to surroundings which many see as a big disturbance with good reasons. We have not yet learnt how to behave when using mobile phones in public places.

Moss (2000) expects that the car is becoming also a workplace to those who have long distances to commute. When waiting in traffic jams one can make the best use of time by using mobile communications tools. Using the mobile phone when driving a car is considered dangerous why it is prohibited in many countries unless you use a hands -free system.

Wireless communication tools can form a moving work station not only in a car but also when travelling on foot, by train, bus, ship and air, with some restrictions. One can also work with good connections to home base in hotels, airports etc.

Mobile communication is a good tool for those whose work is very mobile. Connections to clients are easy, information to main office is easy to send. Representatives of insurance companies can send photos from car accidents and fires. Mobile phone, GPS-receiver and digital maps have given possibilities to organise transport in a new way. Possibilities to make working easier and more efficient are many more and new opportunities will be discovered all the time.

In my research (Talvitie 2003) I also asked the opinions of Finnish urban and regional planners on the spatial impact of mobile communication. The results are represented in figure 1.

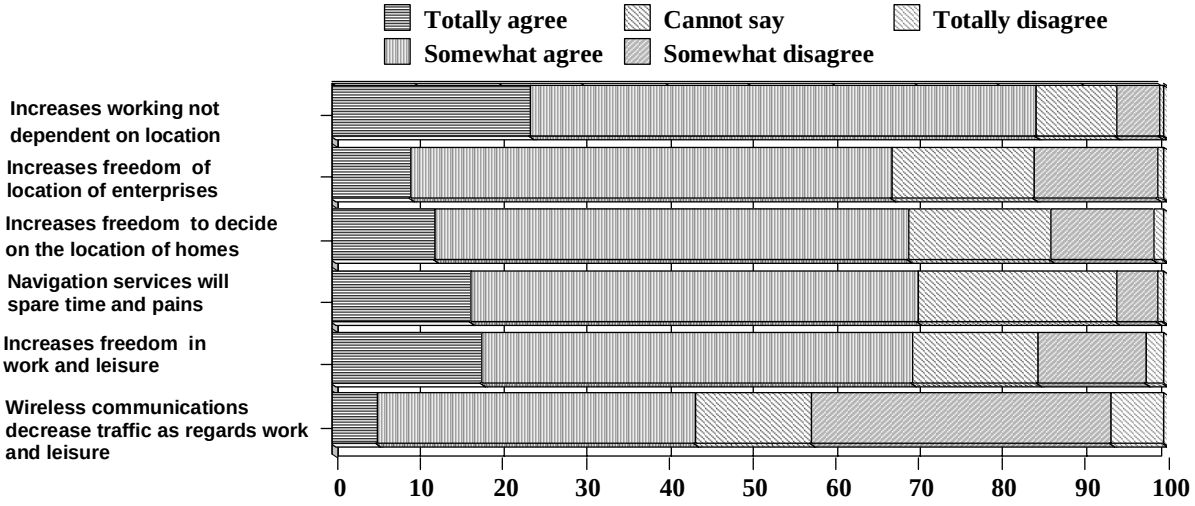


**Figure 1.** Opinions of Finnish urban and regional planners on the spatial impacts of wireless communications (n= 302-305). Source: Talvitie 2003.

The results of the five first statements confirm the opinions that wireless and mobile communications increase the freedom in work and play and in some cases increase the freedom to select the location of enterprises and homes. Mobile communication makes life also easier when one can get services when needed and on the road. These results are also statistically significantly skewed. The opinions on the last statement were split nearly half and half. This means that in some cases mobile communication will decrease traffic in work and spare time and in some cases not.

Suggestions on the spatial impact of the use of mobile communications indicate that there is some direct impact but probably most impact is indirect. The essential word is freedom. Mobile communication gives freedom to do and behave in new ways. How these new behaviours will affect decisions about new spatial solutions is not at the moment very well known because there is only very little empirical research conducted in this area. With good reason it is easy to predict that new solutions will be seen during the course of time when people and organisations realise the opportunities new technology can offer them.

## 5. IMPACT OF ICT ON SPATIAL PLANNING

As spatial impact of mobile communications is both direct and indirect it is only an academic question to discuss them from the point of view of urban and regional planning. It is more relevant to discuss what spatial impact the whole of ICT will have on spatial planning.

I will base this discussion mostly on the results of my recent research mentioned in the introduction. The main conclusion of the study was that information and communication technology should be taken into account in urban and regional planning as a factor which influences spatial development. This suggestion is especially important now because we live in an era

when people and organisations will start to apply the opportunities ICT will offer, in selecting locations for their different activities.

The main suggestions I made in the study are as follows:

- the development of ICT-infrastructure should be included as an essential part to planning,
- the study of spatial impact of ICT should be included in the planning process,
- there are good opportunities for gaining new insights into planning,
- the programmes of planning education and training should be updated,
- the content of planning legislation and guidelines should be updated.

Good reading among others are Kotkin (2000), Kotkin-DeVol (2001) and Mitchell (1999).

### 5.1 ICT-Infrastructure in Spatial Planning

It is often mentioned that the responsibility to build ICT-infrastructure belongs to private companies and therefore regional and local authorities have very little to say about what will happen. This can be the situation if authorities only deal with the building permissions companies require for the different elements of their infrastructure. In some cases authorities only discuss the location of base stations considering the environmental (visual) aspects. These type of reactions are very limited and do not allow for long-term solutions.

I would suggest that local and regional authorities decide on the service standard of ICT they should have in different areas of the region/ city / municipality concerned, and then work for these goals. Local and regional authorities have at their disposal many tools like planning rights and construction permissions. They should negotiate with the operators about the implementation of desired goals and also be willing to pay some of the costs. There are these types of examples in Finland.

The ICT-infrastructure should be seen in regional and urban planning as an important elements like highways, railways, airports and harbours.

### 5.2 Studies on Possible Spatial Impact on the Planning Area

It is argued that why should people or organisations consider new location for their activities because they can benefit from ICT in their current locations. This argument is relevant. Probably in most cases nowadays and in the near future ICT will be applied within current physical structures but this trend will not stand forever for a number of reasons.

One reason to change the location is to get cheaper premises which also can offer reduction in running costs. Companies may reorganise their activities and therefore need new locations where also the use of ICT will be fully applied. Another reason could be the fact that ICT will allow to achieve some personal goals which earlier has not been possible. The use of ICT can make possible to move to a better living environment and have at same time also a bigger house. ICT can also make possible the simultaneous use of urban and rural houses.

As a whole the competitiveness of regions, cities and municipalities will face new challenges. ICT-infrastructure and service standard become essential elements in this respect. ICT will affect the prerequisites of different activities to function in an area. This concerns different types of industries, housing, services, retailing, travelling, commuting and many other activities we may not even be aware today. Therefore within a planning process these questions should be considered not only from the point of view of the authorities but as well from the point of view of different organisations and habitants.

### 5.3 A Challenge for New Insights in Planning

To include a new aspect into an old planning system is not easy. However we live in a world when many new important factors which may affect planning are being introduced all the time. The impact of ICT will be diversified. One can compare ICT with the automobile. It may have equally significant consequences. ICT can be seen as the car of the information society.

The main challenge for planners is how to safeguard the competitiveness of the planning area also in the future. Finnish regional and urban planners have the view that it is possible to create new types of communities because the relationship between work and housing is changing. There is no longer a need to separate these activities as much as in previous years. ICT may decrease the need to commute as much as earlier if workplaces and homes are closer to each other. ICT gives good possibilities to get services via the net and thus improve the living conditions in remote areas.

It is clear that planners will face many difficulties when thinking about new planning principles. Conflicts may be greater between regions, cities and municipalities because some can bee seen as losers and others as winners. The value of property may change and even the role of the city centre can be threatened.

The list of new opportunities is endless and one can not give any firm suggestions as to how to proceed. This is the challenge, the challenge to create new planning methods and models and a new way of thinking.

### 5.4 Education is now Important

I believe that the most important issue for planners is now to try to understand the emergence of information society and the important role ICT is playing in this process. Secondly planners should be familiar with the new way businesses are functioning by using ICT and thirdly how ICT will affect the behaviour of human beings.

After this understanding planners have sound bases for new type of planning. This requires that institutes of further education update their programmes. This same demand applies to universities.

### 5.4 Legislation and Guidelines should be Updated

I learnt in my study that the relatively new Finnish planning legislation did not include any specific provisions to consider the possible impact of the development of information society and possible spatial impacts ICT could cause. The planning guidelines of central government dealt only very little with these issues. The same applied to Finland´s National Land Use Guidelines.

Every country should consider whether there is a need to update essential legal and governmental documents to include provisions for the impact of information society and ICT.

## REFERENCES


Kopomaa, T. 2000. The City in your Pocket: Birth of the Mobile Information Society. Helsinki, Gaudeamus.

Kotkin, J. 2000. The New Geography. How the Digital Revolution is Reshaping the American Landscape. New York, Random House.

Kotkin, J.- DeVol, R.C. 2001. Knowledge-Value Cities in Digital Age. Santa Monica, Milken Institute.

Mitchell, W.J. 1999. *e*-topia. Cambridge, MA, The MIT Press.

Molitor, G.T.T. 2001. 5 Forses Transforming Communications. The Futurist. September-October 2001, pp. 32-37. World Future Society.

Moss, M.L. 2000. Why Cities Will Thrive in the Information Age. ULI (Urban Land Institute) on Future: Cities in the 21st Century, pp. 24-31.

Nokia. http://www.nokia.com

Rainio, A. 2001. Location-based Services and Personal Navigation in Mobile Information Society. Paper presented in the FIG-Working Week in Seoul.

Talvitie, J. 2002. The Influence of Information Technology on Spatial Development. Paper, TS 8.1, presented in the FIG XXIII International Congress, Washington.

Talvitie, J. 2003. Tieto- ja viestintäteknologiasta uusi näkökulma kaavoitukseen. (Translated English name: Information and Communication technology: A New Aspect in Urban and Regional Planning.) Helsinki, Edita Prima Oy.

## BIOGRAPHICAL NOTES

### Juha Talvitie

Born 1935, in Lapua, Finland

Education
1960, Dipl. Engineer (MA in Engineering), Department of Surveying, Helsinki University of Technology,
1969, Licentiate of Science (Tech), Department of Surveying, Helsinki University of Technology,
2003, My dissertation "Tieto- ja viestintäteknologiasta uusi näkökulma kaavoitukseen" , (name in English "Information and communication technology: A New Aspect in Urban and Regional Planning") will be presented for public examination and debate on the 28th of March, 2003 at the Helsinki University of Technology.

Employment record
1960-1961 Planning Engineer in a State Rural Development Authority in Lapland
1961-1964 Managing Director of the Regional Planning Association of Lapland
1964-1967 Managing Director of the Regional Planning Association of South Bothnia
1967-1993 Managing Director of the Association of Finnish Regional Councils
1993-1998 Director, Structural Policy and EU-Affairs, Association of Finnish Local and Regional Authorities
1998 Retirement
1998- TALVITIE CONSULTING as a free lance activity and hobby

Memberships
1960- The Finnish Association of Geodetic and Land Surveyors, Chairman 1979-82
1960- The Finnish Association of Graduate Engineers TEK
1993- World Future Society

FIG
1976- 78, Vice Chairman of the Commission 8
1978- 81, Chairman of the Commission 8
1985- 87, Vice President of the Federation
1988- 91, President of the Federation

## CONTACTS

Mr. Juha Talvitie
Tykistökapteenintie 2 A 3
FIN- 00340 Helsinki
FINLAND
Tel. + 358 9 481 829
Mobile + 358 50 64 829
Fax + 358 50 888 64 829
Email: juha.talvitie@kolumbus.fi