

REPORT 1155

**ADAPTATION OF MOBILE RADIOCOMMUNICATION TECHNOLOGY
TO THE NEEDS OF DEVELOPING COUNTRIES**

(Question 77/8)

(1990)

1. INTRODUCTION AND SUMMARY

Interim Working Party 8/13 was set up in 1985 by Decision 69 to study Future Public Land Mobile Telecommunication Systems (FPLMTS). It considered inter alia that advances and cost reduction in radio and VLSI technologies could make the radio approach a competitive alternative for voice and non-voice telecommunication services, with special emphasis on personal communications, a concept of great interest to developed countries.

Recognizing the disparity that exists in telecommunication infrastructures in the world, this Report points out the potential of cellular technology (and its evolution into FPLMTS technologies) to help developing countries bridge the gap.

Also in 1985, the desire of developing countries in the Americas Region, through the plan-committee for Latin America, to take advantage of cellular technology to satisfy their own needs, including its use in fixed applications, led to Questions 77/8 and 38/9.

Report 1153 and Recommendation 687 include some of the aspects raised by these Questions with the idea that future wireless systems - FPLMTS - can serve the needs of developing as well as developed countries.

The objective of this Report is to emphasize the needs and interests of developing countries by promoting the application of FPLMTS for fixed services. It should furthermore be stressed that the use of FPLMTS for such applications is also attractive to developed countries.

Key objectives for FPLMTS are identified that could benefit developing countries: fixed service; standardization as a possible means of reducing costs; flexibility to start from a small, simple configuration and grow as needed as well as to accommodate special needs; commonality with remote areas of developed countries; large cells and repeaters.

2. THE TELECOMMUNICATIONS GAP

The role of telecommunications in the development process as a means to increase productivity and efficiency as a substitute for or complement to transportation and to save energy, etc. [ITU, a, b, c, 1988] is today more important than ever, but the gap between developed and developing countries is wider than ever. This has been clearly indicated by the Independent Commission for World Wide Telecommunications Development set up by the ITU in 1983, in its report [ITU, d, 1984]:

- 75% of the world's telephones are concentrated in 9 countries.
- 75% of the world's population live in countries with less than 10 telephones for every hundred persons.
- 50% of the world's population live in countries with less than one telephone for every hundred persons.

Faced with this reality one can only agree with the Commission's conclusion: "Neither in the name of common humanity nor on grounds of common interest is such a disparity acceptable."

The main reason for this situation is the limited financial resources available to a developing country to satisfy all its needs and the resulting allotment of resources to telecommunications which is not sufficient to close the gap as much — and as fast — as is required.

3. THE POTENTIAL OF FPLMTS TECHNOLOGIES

Present cellular technology and its evolution into the FPLMTS technologies by the end of the century, offer great potential to help developing countries bridge the gap in a more effective way [India, 1987]. Some of the aspects that make FPLMTS an attractive alternative to traditional wireline systems for telecommunications services are:

- Capability for rapid provision of service in new areas.
- Growth capacity and flexibility.
- Cost reductions resulting from technology improvements, modular design and mass usage of FPLMTS.
- Capability for covering wide geographical areas.

A number of developing countries are currently planning to use cellular technology to solve some of their problems such as lack of service in rural and remote areas or lack of capacity to satisfy demand promptly in urban areas.

4. OBJECTIVES AND ISSUES

Objectives have been set in Report 1153 for FPLMTS related to quality, mobility, flexibility, efficiency, connectivity, adaptability, security, identification, suggestions for charging (billing), etc.

The relative importance that each objective has to a developing country depends, on the one hand, on its stage of development and national goals, and on the other, whether effective cost savings will result from not implementing a specific feature in a particular situation.

Nevertheless, it is important to point out the features and characteristics that stand out as very important to developing countries, and deserve special notice: fixed service requirements, standardization and flexibility.

4.1 FIXED SERVICE

A very important objective defined for FPLMTS, from the point of view of developing countries, is that they can be used for the provision of service to fixed users either in rural or urban areas.

Two main factors that cause a radio solution to be considered are:

High installation and maintenance costs associated with rural wireline networks due to long distances, difficult terrain and climatic conditions.

The high and often difficult-to-foresee growth that limits the ability to plan the outside plant network properly in urban areas.

It is therefore of great importance for situations where wireline facilities are not available, that an FPLMTS can be used as a temporary or permanent substitute for the wireline network.

This objective requires FPLMTS to meet certain conditions and characteristics:

It should, to the maximum extent possible, support equipment and component design that can withstand rural conditions typically found in developing countries, such as rough roads, dusty environment, extreme temperatures or high humidity, while at the same time providing long equipment lifetime with minimum maintenance. It is, however, not intended that the basic FPLMTS equipment satisfies all the needs of the fixed service, while at the same time catering to the FPLMTS. Rather, the basic FPLMTS structure and technology should permit adaptation to fixed service requirements.

It should take into account the effect on reliability and availability of special propagation conditions such as, in mountainous terrains, areas of high rain precipitation or dense forests.

It should allow for large cell sizes.

Since the service to be provided is an extension of the national and international network, it should be possible to integrate it into the network without any, or with only very minor limitations. The objective that FPLMTS should provide a service with quality, integrity and security comparable to that provided in the fixed network is therefore very important to developing countries.

In some developing countries, the service provided by an FPLMTS may well be the only telecommunications pathway, and is likely to act as a lifeline, particularly for the provision of storm and flood warnings or similar public service activities. Service can also be provided to tourist areas, sports events and for other special needs.

The possibility of accessing both terrestrial and satellite systems, through the use of the same band or adjacent bands, could be important to countries with large, thinly populated rural areas. One possible application would be to link rural and remote base stations.

The use of an open architecture is of considerable importance for FPLMTS usage for fixed services as this would permit the administration in developing countries to choose the equipment based on performance needs.

CCIR Reports 380 and 1057 describe methods of providing fixed rural telecommunications and may be referred to for further information.

4.2

STANDARDIZATION

Report 1153 includes a discussion of a common radio interface standard from the point of view of personal communications. The advantage of such a standard in providing for regional and/or world wide roaming of mobile and personal stations as well as the coordination of spectrum allocations and planning are recognized. However, the limitations of a common standard in providing sufficient flexibility to meet diverse national or regional objectives, including the delay inherent in the standards process, are also noted.

From the point of view of some developing countries, standardization of the many interfaces associated with FPLMTS, including the radio interface, may offer important advantages:

- a) Reduction of costs of networks and terminals: Economies of scale resulting from the mass production of equipment generally lead to lower costs. Significant cost differentials, however, may not exist between FPLMTS equipment manufactured to regional standards as opposed to world-wide standards due to the large regional markets that exist.

In any case, lower cost equipment could lead to its use on a wider basis in developing countries.

- b) Increased equipment availability may facilitate the procurement process which could stimulate the introduction of FPLMTS in developing countries. Some developing countries may have an interest in the local manufacture of certain products unique to their markets for FPLMTS and may benefit from the flexibility provided by minimal standards. The use of standard elements within the system, such as speech codecs, RF components, etc., could contribute to the reduction of overall system costs.

4.3

FLEXIBILITY

Great importance has been given to an open, flexible architecture able to match network investment to revenue growth, adapt readily to environmental factors, different applications and new developments.

Of special importance to developing countries is to define the simplest possible system (e.g. speech alone), both from the point of view of hardware (terminals, base stations) and software. This may reduce cost and simplify maintenance. Of further special interest is the capability of the system to start from a small (e.g. stand-alone base station) and simple "stripped-down" (e.g. no roaming between cells or within a cell) configuration and grow as needed, both in size and complexity; thus enabling very low subscriber densities and low traffic rates to be catered for. This option, could allow a subset of the system's full service capability to be provided with minimum initial investment.

The use of a modular structure to permit simple configurations and future growth is of particular importance in developing countries.

Furthermore, there are special needs for fixed services such as: repeaters for covering long distances between terminals and base stations; PABX's, concentrators or small rural exchanges with wireless trunks; and different types of terminal equipment (2 or 4 wire terminals, coin boxes, etc.). The interface No. 8, defined in Figure 1 of Recommendation 687 and Report 1153 may be suitable to link MS to a PABX. This means, among other things, that the system should be able to be configured for situations of high traffic per terminal.