3.06 Hardware (and Network Set Up)

Developments in the PC market have led to faster and cheaper machines that support multiple operating systems. Peripherals remain costly and difficult to repair. Maintenance and technical support continue to be problems, although the development of local markets has begun to help. PC-technology is most often the appropriate choice for municipal-scale projects in developing countries. As with any project, it is important to evaluate the user needs, and pick hardware appropriate to the project, the long-term goals of the installation, and which can be realistically supported.

3.06.01 Computer

Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations.

Consequently, all new **PC hardware** will function well with GIS software today. As the GIS processes files that might be quite voluminous in size, it is recommended that special attention is given to boost internal memory (RAM) to 1024 MB.

A **laptop** is more expensive than a PC with the same performance but might be more practical to use for surveys and consultations (connected with a projector).

3.06.02 Peripherals

Aside from a functioning computer the following peripherals are useful:

An **A3 (ink cartridge) color printer**. The A3 format (or the somewhat smaller portfolio size) has been proven to be a most suitable format to present maps on a municipal 'scale' to be included in reports, etc., and can also be used for other graphs aiming to visualize the work of the Planning Office (posters, brochures, banners, etc.) in an attractive way.

There should be extra sets of ink cartridges in stock and must be always replenished. They are however 'perishables' and have an expiration date, and the ink eventually runs dry.

In most cases, for quality prints, the 'fast-print/economy-print' mode will save a lot of ink and money as many prints might contain maps and illustrations.

Laser printers, which have become much cheaper lately, are a cost saving alternative for large quantity printing of monochromatic documents compared to using an ink cartridge printer.

Although prices have come down from the previous years, a low-income municipality will not frequently need a plotter that can print in larger formats than A3. Instead, try to make friends with a nearby private or public institution with such plotter that can help with the reproduction during the few times it is needed.

Digital cameras have become very cost-effective and easy-to-use instruments for monitoring and maintenance activities. It is recommended that the Municipal Planning Office procure one for its use. A camera with 3 MB picture resolution is more than enough for photo documentation in a CLUP.

A **handheld GPS** is affordable nowadays and is most useful in capturing spatial locations of objects in the CLUP. It is advantageous (but not extremely necessary) to bring a laptop and data cable to transfer positions. A car lighter plug for the GPS is also necessary because the battery is often at risk of running low in the middle of a field work. Nowadays, GPS is already being integrated into PDAs and cellphones. Software installed in these PDA GPS allows user-made datasets like their base map which allows them to view the positions being observed in real time without the need of a laptop. Other units also have Bluetooth or WLAN which allows wireless connection to a laptop or PDA with a GIS software via Bluetooth or WLAN, and allows real time readings.

An **A4 scanner** has an affordable price tag and is extremely useful once one has got the right touch. In combination with Optical Character Reading (OCR) software it will save a lot of time when large amounts of paper data need to be put into digital format.

External USB hard disks are becoming inexpensive, and are very useful as a back up for a small planning office.

The **flash disk memory** (USB flash drive) has replaced the floppy disk and is very handy in data sharing. A USB flash drive is like a small hard drive, about 2-3 inches long, that plugs into the computer through a USB port. Data can be downloaded into it for storage. It is portable and files can be saved, modified, or deleted as often as needed. However, because of their size, USB flash drives are easy to misplace**.** The flash disk is normally a sufficient solution for data sharing (but not data storing) in a low-income municipality. (But might need a driver if you are using old computers)

A **computer projector** is slowly going down in price and can be useful at large meetings. Lumen (ANSI) and resolution (dpi) are the quality indicators and keep in mind that the lamp is very expensive to replace.

Access to a reliable power supply is still a major problem in many developing countries, though this is improving in some urban areas. The use of voltage regulators and **Universal Power Supply (UPS)** units is critical to safeguarding hardware and mitigating work loss and stoppages. In environments where adequate office space may be scarce and heating and cooling systems may be less than adequate, working conditions can be troublesome.

3.06.03 Network
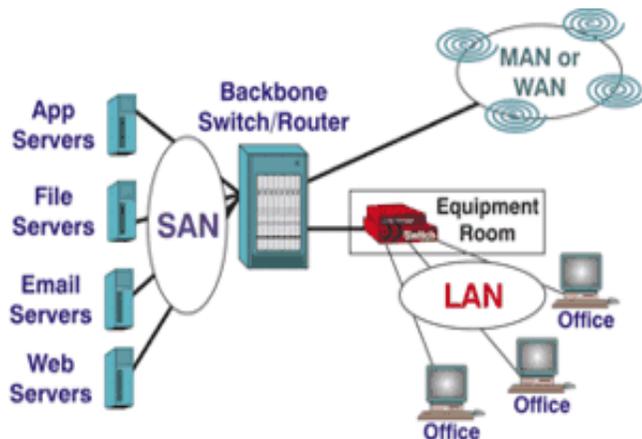
In the CLUP GIS Guidelines, not much attention will be paid to networked GIS solutions as such models miss the mark in the situation when a low-income LGU is starting up a GIS for CLUP preparation.

However, for information purposes there are four kinds of networks, namely:

Local Area Network (LAN), which connects computers in limited numbers in, for example, an office, using a server,

Wide Area Network (WAN) is a more complex system in which a number of LANs are linked together. It is suitable for a large LGU with a corporate GIS with several office buildings spread over an area.

Network Attached Storage (NAS) is a network designed to attach computer storage devices such as disk array controllers and tape libraries to servers.

Storage Area Network (SAN) is a network designed to attach computer storage devices such as disk array controllers and tape libraries to servers.

The relatively small amount of data that is needed to prepare a CLUP and the frequency of sharing the data kept within reasonable bounds do not justify a network solution. Instead, data sharing using flash disks or read and writable CD-ROMs is a cheaper and sufficient solution. And in due time when the amount of data becomes unmanageable in a stand alone computer environment, and the pace of data sharing requires a more sophisticated solution, the municipality/city will be motivated to step up connectivity by introducing a network. It is then recommended to install a wireless solution, which in a few years time will be both cheaper and more reliable than a line network.