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DFID Internet Costs Study

Appendix C: Country Case Study: Nepal

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Executive Summary

Internet subscribers in Nepal amount to 0.05% of the population (with perhaps the same proportion of e-mail only subscribers), fixed telephone subscribers amount to 1.1% of the population and mobile telephone subscribers amount to 0.05% of the population. These figures are all low. However, there are more internet users than they indicate, especially when the roles of internet access resale, internet cafés and voice over Internet Protocol (IP) are acknowledged; one estimate is that internet users amount to 0.5% of the population (ignoring foreign visitors).

Notwithstanding these low figures, growth in Internet access has been high since the market for data services, and in particular for the provision of international Very Small Aperture Terminal (VSAT) links, was opened in 1999. There are now perhaps 6 VSAT providers and 12 active Internet Service Providers (ISPs).

Internet use is constrained by:

- Politics (the residual protection of the incumbent and the high taxation on the ISPs).
- Economics (the prevalence of very poor and small enterprises).
- Education (the shortage of comprehensible and useful web content).
- Technology (the dearth of telephone lines and the absence of links between the ISPs).

The technological constraints on Internet use are being reduced in various ways; for instance, the ISPs have set up their own international links independent from the incumbent and resell capacity on their national and international links to other ISPs.

The major costs of ISPs currently are statutory levies such as taxes, the Internet gateway service connecting the ISPs to the global Internet and staff with the associated overheads. The first of these afflicts all ISPs. The second and third reduce sharply when the ISPs grow.

The dominant cost for Internet users arises from local call charges, even although these are low. Internet usage might be adversely affected by raising them, unless the revenue were shared with the ISPs.

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1 Background

1.1 Geography

Nepal is a landlocked country roughly twice the area of Benelux bordered by India to the south and by Tibet and thence China to the north. Access is limited and difficult, although the international airport in the outskirts of Kathmandu is serving the development of tourism, through both the external flights and the many internal flights (often for sightseeing). Hitherto tourism has been largely limited to trekkers, who provide some Internet demand, but Nepal has a plan to attract richer and freer-spending tourists. This entails expanding the airport and improving security.

1.2 Population

With the population growing by 500,000 (2.4%) annually, Nepal is hard pressed to develop basic services. The people continue to suffer from poverty, inadequate education and unreliable utility infrastructure. 42% of the people live below the poverty line. The earning power and leisure opportunities do not favour the development of residential dial-up access even though households are large (the mean household size is 5.4).

Schools in urban areas have started computer education recently but the 90% of the people who live in rural areas have no computer knowledge. However, only 2% of the population can use English and there is almost no Nepali Internet content. The limited knowledge of English is a barrier both to computer education and to popularisation of the Internet.

Higher education is being raised to the level in other South Asian Association for Regional Co-operation (SAARC) countries; for example two-year courses have been changed to three-year courses. Already the proportion of children leaving Nepal for higher education and subsequent careers is high, with more qualified people than there are jobs. However, many pupils still aspire to use their education in and for Nepal.

78% of workers (including unpaid family workers) are self-employed. The scale of self-employment is high not only in rural areas but also in urban areas, where it is 57%[1]. As many of these workers are not highly educated they will not themselves need Internet access, but they might

[1] Nepal Human Development Report, United Nations Development Programme, 1998 (http://www.undp.org.np/keydoc/nhdr98/contents.html).

wish an ISP to provide web pages displaying their goods to tourists and residents. The pool of small and medium businesses that might afford and use the other services of an ISP is also reduced because of this high proportion of self-employed workers: in 1994/1995 a manufacturing establishment employed about 54 people and had a wage bill of $13,000 on average[2].

1.3 Economy

There is little heavy manufacturing, although there is considerable evidence of metalworking and local construction and assembly skills in Kathmandu and its environs. Indeed, wood continues to be used for much decorative work, with exquisite carving, with metal sheet being used for much storage and furnishing. Such skills also ensure that machines of all sorts are repaired and kept serviceable far longer than is the norm in western countries. Although this limits opportunities for further replacement manufacturing, it utilises a different skill set and provides industry and employment.

Craft skills (especially weaving, sewing and leather-working) and agricultural products are currently responsible for many exports. In fact agriculture is the main feature of the economy: it occupies 80% of the people and produces 40% of the GDP, with many people still employed as bonded labourers (even although slavery was abolished in 1924). Nonetheless, the country moved from being a net exporter to a net importer of food some ten years ago; there is little evidence of a reversal.

Area	147,181 sq Km
Population (1998)	21.8 million
Gross Domestic Product (1999/2000)	$5,378 million
GNP annual growth rate (1999/2000)	6%
Exports (1999/2000)	$464 million
Imports (1999/2000)	$990 million
Literacy rate (1991)	40%
Per capita income (1998)	$ 222

Table 1: Country indicators[3]

Only 15% of the total population have electricity, although the Nepal Electricity Authority has now expanded its transmission capacity to supply

[2] Statistical Pocket Book, Central Bureau of Statistics, His Majesty's Government, 1998.
[3] Economic Survey Fiscal Year 1999/2000, His Majesty's Government, 2000 (http://www.facd.gov.np/pub/ecnmsrvy2000/contents.htm)

electricity to 28% of the population. Solar sources are used to support remote telecommunications.

Established domestic and foreign businesses are not investing significantly in Information Technology (IT). The annual IT sector business volume is at most $10 million. Personal Computer (PC) penetration is 0.28%; about 20,000 PCs are bought each year[4]. The small market size has been one deterrent to reducing equipment prices and therefore Internet costs.

1.4 Political situation

Following two years of political unrest, externally imposed embargoes and internal disputes the first free elections in thirty years were held in 1991. Democratic practices have held by slender threads with current stability remaining weak. Since 1996 Maoist insurgents have waged a guerrilla war, largely in the more remote areas, although now visiting the more populated (and western-visited) areas. This has begun to have a greater effect on both local and western projects - causing the closure of schools and the withdrawal of medical support. The state of political inaction is amply illustrated by the Army Chief of Staff refusing to send troops to support villages in the remote areas until the government as a whole so instructed. However there are still armed military guards at telephone exchange, office and relay sites.

The current political upheavals are already causing strain, inflicted by both the guerrilla incursions and the growth towards fully-fledged democracy. The deliberate traffic blockages and curfews are manifestations of widespread undercurrents of unrest. The aftermath of the killing of the royal family also displays this; it remains to be seen whether the monarchy can survive the damage to its reputation[5].

[4] Internet and charging in Nepal, S.B.Thapa, NTC, 2000 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.ID.02_Nepal.doc).
[5] Synopsis of the High Level Committee Report on the Royal Palace Incident, 2001 (http://www.nepalnews.com.np/archive/2001/june/syp.htm).

2 Telecoms status

2.1 Regulatory framework

The Nepal Telecommunications Authority (NTA) was formed under the Telecommunications Act of 1997[6]. It is charged with developing the Telecommunications Policy promulgated in 1999[7]. It issues licences to VSAT providers, VSAT users, ISPs, paging operators, fax operators, video conference providers and mobile network operators.

The Nepal Telecommunications Corporation (NTC) still enjoys a monopoly of voice services. It is required to complete tariff re-balancing by 2004, face competition in all services after 2004, and to spread telecommunications throughout Nepal with the assistance of the Rural Telecommunications Development Fund and private operators.

NTA have invited applications to provide fixed network services with wireless local loop technology and for Village Development Committees (VDCs) in the eastern development region. Only two companies responded to the invitation to operate wireless local loop technology, probably because tying service delivery to a particular technology weakened the business case. There have been no reports on the invitation to provide subsidised fixed network services for VDCs; if successful it is intended to be followed by more that bring telephone services to other rural areas that NTC does not cover.

NTA have also invited applications to provide mobile network services. The competitive tendering process for the issue of the second mobile licence was widely agreed to be above board. However, the Communications Union has sought an injunction to prevent the competing mobile operator from setting up service until a five year monopoly has expired in 2002.

2.2 Industry structure

The telephone service has developed slowly since its start in 1913. The reasons for this are varied; they include tight central control of NTC and

6 Telecommunications Act, B.S 2053, His Majesty's Government, 1997 (http://www.nta.gov.np/telecom_act.htm).
7 Telecommunications Policy, B.S 2056, His Majesty's Government, 1999 (http://www.nta.gov.np/telecom_policy.htm).

its predecessor government department and the lack of money to spare for expansion and development. Nonetheless, the NTC fixed network is fully digital (with 124 exchanges of 8 types) and many exchanges could be equipped to offer ISDN services[8].

NTC remains profitable with profits before tax of $40 million in 1998/1999, $37 million in 1997/1998 and $28 million in 1996/1997 and with a return on investment of about 22%[9]. The profits are contributed to Government funds.

NTC currently serves 270,000 lines, with a waiting list of nearly 290,000. The average waiting time has been cut to eight years (although this average hides a worse reality in many areas). NTC plans to provide a further 300,000 lines including over 20,000 lines in the rural areas; the objective is to achieve a telephone penetration of 2.5% and provide at least 2 telephone lines to each of the 3,913 VDCs by the end of 2002 (although the end of 2004 is more likely to be the date of attainment). In 1999 only 39% of the VDCs were connected.

The difficult terrain and the low and sparse population in the rural and isolated areas do not offer economies of scale for normal copper services. This goes some way towards explaining the low telephone penetration of 1.1% (in 2000): nearly 170,000 (62%) of the lines are in Kathmandu with almost all of the remainder in the other large towns. Kathmandu itself has a telephone penetration of 20%, whereas the rural areas attain only 0.06%. The districts in rural areas are mainly connected to the large towns by Multi Access Radio Telephone System (MARTS) technology offering 22,335 circuits, although some rural areas are connected by VHF radio and VSATs[10].

In conjunction with the International Telecommunications Union (ITU) NTC has issued a request for proposals for the supply of a voice over IP network in some selected urban and rural areas. However, it is not clear that such a small network would have lower capital and operating costs than the current network if it were required to offer voice quality and reliability equivalent to those in the current network.

The backbone of the network is an east-west digital microwave link carrying 20,000 circuits between the large towns, although there is also a

[8] Information and Communication Infrastructure, Final Draft, Formulation of Information and Communications Technology Policy and Strategy, National Planning Commission, 2000 (http://www.joinme.net/hmtrust/dinesh/MBA/internet/universalacess.htm).
[9] Annual Report 1998/1999, NTC, 2000.
[10] Internet and charging in Nepal, S.B.Thapa, NTC, 2000 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.ID.02_Nepal.doc).

small fibre optic link. NTC has plans to create a fibre ring around Kathmandu and an east-west fibre link running alongside the main highway. Five VSATs will be used to make up a regional satellite network as a back up to the terrestrial network.

The international connections comprise a fibre optic link to India, a digital microwave link to Bangladesh and Intelsat circuits; together these provided 877 circuits in 1998/1999, 851 circuits in 1997/1998 and 455 circuits in 1996/1997. (The large step change in capacity is symptomatic of how introducing fibre optic links changes matters.)

Employment in NTC has risen by only 20% during the recent growth: employees per thousand lines in the fixed network are said to number 17 in 2000/2001, having been 46 in 1995/1996. Meanwhile complaints have fallen by 75%.

The NTC mobile network came into service in 1999. It currently runs at full capacity with 11,117 subscribers. The service is provided in four areas, centred upon Kathmandu (9919 subscribers), Biratnagar (328), Birgunj (477) and Pokhara (393). As callers dial a different code for each area the service is less convenient, but also less expensive, than it could be. There have been major problems with billing software, in that customers have been cut off for apparent non-payment; these are now being addressed.

Payphone provision is currently limited to public call premises. There are about 200 of these premises registered with NTC and 1,000 unregistered and largely ignored by NTC.

There are 117 licensed cable television operators, 99 of whom are in operation[11]. There are believed to be about 70,000 cable television subscribers. The cable television networks may not all have the bi-directional capabilities needed for internet access, so they might supplement, but not supplant, fixed telephone network connections for internet access. Space Time Network, a cable television operator in Kathmandu said to have 35,000 subscribers, has announced plans to deliver internet to set-top boxes (instead of to cable modems connected to PCs), but these plans are not yet implemented. (Space Time Network also received a controversial licence as a satellite television operator but lost the licence because the system was not installed.)

[11] Economic Survey Fiscal Year 1999/2000, His Majesty's Government, 2000 (http://www.facd.gov.np/pub/ecnmsrvy2000/contents.htm).

2.3 Government policy

The NTC plans reflect the IT policy recently approved by the Government, which aims to place Nepal on the global IT map in the next five years[12]. The Government IT policy document does not provide implementation plans but in the area of telecommunications expresses the following intentions (re-phrased from the original):

There will be a north-south info-highway and an info-super highway (presumably east-west).

Nepal will be linked with other parts of the world through a broadband information network.

Internet Points Of Presence (POPs) will be established in all six development regions by fiscal year 2001/2002 and in all 71 districts by 2003/2004, to provide dial-up access at local call rates.

The use of the Internet will be gradually extended to rural areas.

The charge for telephone calls used for the Internet will be gradually reduced.

Internet access will be made available free of cost to universities and schools for four hours a day within the next five years.

Voice communications between company sites will not need to use the public switched telephone network.

IT companies will get telecommunications and electricity services.

Schools and hospitals will be encouraged to use IT services where telecommunications and electricity services are available; to this end the use of solar power will be encouraged.

[12] Information Technology Policy, B.S 2057, His Majesty's Government, 2000 (http://www.nepalit.com/itpolicy2000.htm).

3 Internet status

3.1 Regulatory framework

VSAT providers and VSAT users such as ISPs are permitted under licence by NTA. (Other licensed VSAT users include banking and teaching institutions.) Voice services are supposed to be the preserve of NTC.

The continuing liberalisation of telephony and internet services is leading to the proliferation of public call premises aside from the more formal internet cafés. They advertise web browsing, e-mail, fax and voice services, including voice over IP services in some cases.

As the margins on international voice traffic using international settlements are very wide, call-back services can offer both savings to the users and profits to the providers[13]. By demanding high tariffs for international calls, incumbents allow call-back and other services with rather poor quality to have generous margins[14]. In Nepal NTC is supposed to carry the international voice traffic. NTC derived 56% of its revenue from international calls in 1999, although such calls constitute perhaps 8% of the traffic and absorb only 16% of the operations and maintenance expenditure[15]. Since the liberalisation of VSAT provision the profits of NTC have been falling because NTC is losing these calls[16]. NTA formally requested ISPs to desist from allowing call-back voice over IP services, but they may not always be doing so, owing in part to the difficulty in distinguishing between legal fax traffic and illegal voice traffic.

3.2 Industry structure

The main ISPs are identified in Table 2; all except the first three came into being after the liberalisation of VSAT provision. NTC started as an ISP in

[13] World Telecommunication Policy Forum, Report of the Secretary General on IP Telephony, ITU, 2001 (http://www.itu.int/wtpf/sgreport/revised version 9 march/SecGen9march_e.pdf).

[14] Report of the APT seminar on Internet Charging, APT, 2001 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.AD.07_InternetCharging.doc).

[15] Annual Report 1998/1999, NTC, 2000.

[16] NTC likely to lose Rs 500m in revenue, Kathmandu Post, 30 March 2001 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2001/mar/mar30/index.htm).

2000 and now has at least 1300 Internet subscribers and 400 e-mail subscribers. Altogether now 18 ISPs have been licensed and about 12 are operating.

	Subscribers	Employees	Provider of international link	Capacity of international link
Mercantile	1,347	28	Mercantile	3 Mbps down; 1 Mbps up
WorldLink	6,000	80	WorldLink	3 Mbps down; 1.5 Mbps up
Computerland	887	37	Mercantile	304 kbps down; 32 kbps up
Capital Online	650	17	C&C	n.a.
Unlimited NuMedia	555	28	Mercantile	n.a.
HTP	n.a.	10	C&C	n.a.
Himalayan Online	190	22	Mercantile	128 kbps down; 128 kbps up
Infocom	500	30	C&C	240 kbps down; 64 kbps up
Everest Net	373	17	Mercantile	128 kbps down; 64 kbps up
NTC	1,300	n.a.	NTC	2 Mbps down; 2 Mbps up

Table 2: ISP characteristics[17]

Although Internet access is possible wherever the telephone service is available, it is expensive if long distance calls must be made. Having local Points of Presence (POPs) ensures that local users of an ISP do not need to make long distance calls. NTC has four POPs in Kathmandu, connected by 2 Mbps links, with further ones planned or operating in Biratnagar, Birgunj, Bhairahawa, Pokhara, Nepalgunj and Dhangadhi (which together reach all the development regions). Some other ISPs have POPs in large towns besides Kathmandu, covering between four and eight such towns in total.

Until the market in data services was opened to private operators (in 1999) all the ISPs were using the international leased circuits of NTC. Opening the market has led NTC to halve its prices and offer discounts of at least 25% for contracts of more than one year[18]. (These discounts

[17] The Internet from the Top of the World: Nepal Case Study, ITU, November 2000 (http://www.itu.int/ti/casestudies/nepal/nepal.htm). Several figures have been amended or added from other sources.
[18] Annual Report 1998/1999, NTC, 2000.

suggest that NTC believes that the prices for international leased circuits could fall still further.) However the ISPs generally buy Internet connections from VSAT providers other than NTC, connecting to them by wireless links or national leased lines from NTC. Currently Internet bandwidth through these other VSAT links is about 11 Mbps downwards and 6 Mbps upwards. (The circuits supporting NTC international voice traffic would require about 15 Mbps in both directions, on an assumption that the voice is compressed by a factor of four.)

The sellers of Internet connections to ISPs themselves rely on satellite capacity and Internet connectivity which are provided as in Table 3. They generally buy single services that include both satellite capacity and Internet connectivity, although they could negotiate to buy separate services from satellite capacity providers and Internet connectivity providers.

	Satellite	**Provider of satellite capacity**	**Provider of internet connectivity**	**Location of internet hub**
Mercantile	ST1	Singapore Telecom	Singapore Telecom	Asia
WorldLink	JCSAT3	Loral Cyberstar	Loral Cyberstar	North America
C&C	n.a.	Loral Cyberstar	Loral Cyberstar	North America
NTC	n.a.	Intelsat	Teleglobe	North America

Table 3: ISP international link providers

NTC was intending to sell to ISPs capacity on its 2 Mbps link, which has remained under-used because of internal demarcation within NTC. Meanwhile Mercantile has increased its bandwidth from 3 Mbps downwards and 1 Mbps upwards to 5 Mbps downwards and 2 Mbps upwards.

The ".np" Top Level Domain (TLD) is administered by Mercantile Office Systems, the progenitor of the first ISP in Nepal, not by NTA; registration is free. An ".np" TLD domain name does not necessarily denote a Nepali organisation; in particular, some Japanese organisations have used ".np" owing to the phonetic link with "Nippon". At the moment about 500 ".np" domains are registered and nearly 300 Internet hosts are available but little local web content is held in Nepal.

3.3 User base

The number of Internet subscribers in Table 2 is about 12,000, but this is an underestimate of the number of Internet users: there is resale (for instance, from Mercantile to Health Net) and retail (through internet cafés

and other public call premises). In fact, it has also been estimated that 25,000 Internet or e-mail subscribers exist and that more than 100,000 people use the Internet in Nepal[19]. These estimates suggest that Internet subscribers and e-mail only subscribers constitute about 0.05% of the population each.

Most customers use dial-up modems (with rates of at most 56 kbps) for Internet browsing. ADSL connections are not yet used. Some companies (probably well under 100) connect to ISPs over radio links or NTC leased lines.

There are long-term plans to develop both the Internet for public and private use and Nepal itself as a centre of excellence for IT-related services. One current example is provided by an ISP (Unlimited NuMedia), which has set up a voice-to-text transcription service for US medical practices, by training 200 people as transcribers and providing computers to support 70 transcribers at once.

3.4 Service packages

The ISPs normally provide a range of services, covering web browsing, e-mail delivery, fax and web hosting. Those intended for business customers may also offer software creation and distribution services or be affiliated to business consultancies.

The ISPs report that the rates offered in Internet cafés are almost below their costs. (Current rates in Internet cafés are between $0.5 and $1 per hour.) This presumably indicates that competition is intense but that nonetheless the ISPs are keen to enter markets.

All the ISPs base their prices for dial-up Internet usage on limited connection time or unlimited connection time (at flat rates), for certain times of day. They package their prices in different ways, intended to be attractive and affordable to different market segments; for instance, they may require that limited connection time be paid for in advance and consumed within a certain period (one month, say) or at a certain rate (one hour per day, say). In particular, they often offer e-mail only accounts, without web browsing, at much lower prices than full Internet access.

[19] Internet and charging in Nepal, S.B.Thapa, NTC, 2000 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.ID.02_Nepal.doc).

An International Telecommunications Union survey of South Asian countries indicated that dial-up access in Nepal costs rather less (in rental and call charges) than in several other of those countries[20]. Since that survey, prices have fallen further because of competition (especially for the internet gateway business provided by NTC and the VSAT licensees). Current prices are in Table 4. In some cases the e-mail service would add an extra $1 or $2 to the monthly expenditure.

	50 hours ($)	**100 hours ($)**	**200 hours ($)**	**Unlimited ($/month) yearly contract**	**Unlimited ($/month) monthly contract**
Mercantile	n.a.	n.a.	n.a.	26	33
WorldLink	21	36	n.a.	16	18
Capital Online	22	30	46	13	19
Unlimited NuMedia	n.a.	n.a.	n.a.	24	24
HTP	20	36	69	23	24
Infocom	24	39	n.a.	13	17
Everest Net	13	24	n.a.	12	14
NTC	n.a.	n.a.	n.a.	12	14

Table 4: ISP prices for dial-up users

In addition dial-up users need to pay for the telephone service. For instance, 15 hours of dial-up use per month, including rental and evening local call charges, but excluding value-added tax and once-off costs, would cost about $7.7 (on the Capital Online tariff for 200 hours of use); of this $3.8 would be payable to NTC and $3.9 would be payable to the ISP. If the dial-up use excluded rental (by using an existing line) but required morning local call charges, the cost would be about $8.6, of which $4.5 would be payable to NTC and $3.9 would be payable to the ISP.

The average demand per subscriber is said to be 28 hours of dial-up use per month (or about 1 hour per day).

For ‘always on’ access (with unlimited usage, of course), the prices depend on the bandwidth supplied.

[20] The Internet from the Top of the World: Nepal Case Study, ITU, November 2000 (http://www.itu.int/ti/casestudies/nepal/nepal.htm). The comparison deals with the lowest priced plans for a minimum of 15 hours of dial-up use per month, adapting from ISP tariff schedules for January 2000 accordingly. Extra hours are billed at peak rate. Tax is excluded.

	32 kbps ($/month)	64 kbps ($/month)	128 kbps ($/month)	2 Mbps ($/month)
Everest Net	285 excluding NTC leased line; 355, 425 or 495 including NTC leased line and depending on the main distribution frames used	500 excluding NTC leased line; 570, 640 or 710 including NTC leased line and depending on the main distribution frames used	928 excluding NTC leased line; 1068, 1208 or 1348 including NTC leased line and depending on the main distribution frames used	n.a.
NTC	890	1,483	2,671	28,494

Table 5: ISP prices for 'always on' users

The Everest Net price excludes the local leased line (because Everest Net can provide their own radio link) but the NTC price includes the local leased line price. Even when the Everest Net price is adjusted to include the local leased line it remains much lower than the NTC price, despite the fact that Everest Net buys VSAT capacity from another ISP (Mercantile). (The Everest Net contracts last for three years payable a year in advance; the NTC contracts are available also on other terms but are discounted in Table 5 for direct comparison with the Everest Net ones.) Such a discrepancy in prices might arise if the Everest Net price was intended for individual companies whilst the NTC price was intended for ISPs that aggregated traffic from individual companies.

Currently there are very few 'always on' users. This is unsurprising, given the price difference between unlimited dial-up use and 'always on' use: where local call charges are applicable, a dial-up connection could be used for 24 hours per day without costing as much as a 32 kbps 'always on' connection. (There might be a better quality of service with the 'always on' connection, but the price difference would make this a secondary consideration.) The 'always on' tariffs are most appropriate to remote sites which would otherwise have to pay national call charges for Internet access.

The fixed network call charges, which are required for dial-up access but not for 'always on' access, are outlined in Table 6. These charges are low and might rise with re-balancing; indeed, NTC has proposed doubling them. However, any rise should to take account of the high price elasticity of demand experienced in South Asian countries and of the potential for revenue to increase when there are revenue sharing agreements with ISPs.

Hand set purchase ($)	**Deposit ($)**	**Ownership tax ($)**	**Connection ($)**	**Rental ($/month)**	**Local call ($/minute)**	**National call ($/minute)**	**Inter-national call ($/minute)**
20	14, 28, 42 or 70 depending on the district	21	29	2.3 including 100 calls	0.005 8am-6pm 0.0025 6pm-8am	0.017 - 0.137 depending on the district	0.64 - 2.57 depending on the country

Table 6: NTC fixed telephony prices[21]

The mobile network call charges given in Table 7 are much higher than the fixed network call charges. They would preclude the use of mobile telephony for Internet access even if low penetration did not do so.

Hand set purchase ($)	**Deposit ($)**	**Ownership tax ($)**	**Connection ($)**	**Rental ($/month)**	**Local call ($/minute)**	**National call ($/minute)**	**Inter-national call ($/minute)**
285	142, 214 or 357 for local, local and national, or local, national and inter-national calls	21	42	14	0.09 outgoing, 0.04 incoming 7am-9 pm; 0.04 outgoing, 0.02 incoming 9pm-7am.	0.17 outgoing, 0.04 incoming 7am-9 pm; 0.09 outgoing, 0.02 incoming 9pm-7am.	0.09 + country rate outgoing, 0.04 incoming 7am-9 pm; 0.04 + country rate outgoing, 0.02 incoming 9pm-7am.

Table 7: NTC mobile telephony prices[22]

[21] This is adapted from http://www.ntc.net.np/services.htm.
[22] This is adapted from http://www.ntc.net.np/gsm.htm.

4 Internet costs

4.1 Statutory levies

An ISP other than NTC is subject to the following statutory levies:

A licence fee of NRs 300,000 for five years ($71 monthly, ignoring interest), payable to NTA.

A royalty of 2% of gross revenue, payable to NTA for the Rural Telecommunications Development Fund.

Service tax of 4% of gross revenue, payable to the Government, with half for the Rural Telecommunications Development Fund.

Value-added tax of 10% of gross revenue (reduced by corresponding payments by suppliers), payable to the Government.

Tax deduction at source of 15% of the sum paid to the satellite capacity providers and Internet connectivity providers (raised from 3% in 2001), payable to the Government.

Income tax of 30% of gross profit, payable to the Government.

The new high rate of tax deduction at source was justified as a tax on the foreign bandwidth providers. However, as there are no double taxation agreements between Nepal and the countries of the bandwidth providers, the bandwidth providers do not pay and ISPs become their surrogates[23]. The ISPs do not seek to reclaim the tax from the bandwidth providers, because the bandwidth providers would then recover their costs by raising the bandwidth price.

A tariff of $12 per month, excluding value-added tax, would currently be the lowest for unlimited usage. However, for an average demand per subscriber of 28 hours per month, an unlimited usage tariff is not the cheapest; instead some form of limited usage subscription, renewed when it was exhausted, would be more suitable. If the tariff for 100 hours was $36, excluding value-added tax, an ISP having 800 subscribers would incur a cost of $1.70 per subscriber per month from the first four of

[23] High taxes sounds the ISPs knell, Kathmandu Post, 28 May 2001 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2001/may/may28/index.htm).

these six statutory levies before the refund of value-added tax on supplies and would charge $11.09 including value-added tax.

4.2 Internet gateway service

The NTC Internet gateway service charges are listed in Table 8. Two parties can share a single channel, with each paying 60% of the price quoted below. Charges must be paid three months in advance. There are discounts for advance payments covering greater periods and reductions of 10% per year after the first year of subscription. These discounts are applied in Table 5 but not in Table 8.

Speed (kbps)	Connection ($)	Rental ($/month)
9.60	36	429
19.20	51	714
32	57	1,071
64	71	1,786
128	100	3,214
256	129	5,529
512	157	8,571
1024	171	17,143
2048	214	34,286

Table 8: NTC Internet gateway service prices[24]

Modem speeds and user expectations are rising, so the bandwidth per user which an ISP needs is rising. Hence not all reductions in Internet gateway service charges can be passed on to the users. Moreover for low numbers of subscribers, disproportionately large amounts of bandwidth are needed: there are economies of scale which a small ISP, or even a small POP for a large ISP, cannot achieve. Despite this, as discussed above, the prices offered by Everest Net (for instance) are much lower than those offered by NTC.

Few ISPs are interconnected in Nepal: traffic between users of different ISPs in Nepal crosses the world to exchange points somewhere else. This is expensive and slow. Having an Internet exchange point in Nepal would alleviate this and contribute to reducing the demand for foreign hosting of sites. If it also aggregated genuinely international traffic it would also enable the ISPs to achieve economies of scale in bandwidth purchase. Many ISPs already use the international gateway services of

[24] This is adapted from http://www.ntc.net.np/int_service.htm.

one VSAT provider, which could therefore provide a suitable exchange point if doing so were in its interests. However, although the ISPs form a loose special interest group they do not yet seem ready to pool resources or to set up an exchange point.

Similarly direct Internet connections with neighbouring countries in the region would reduce global connectivity costs. They would also increase the flexibility and redundancy of networks and help to develop a regional backbone. However leased line costs in India may not yet make this more cost-effective than the present, seemingly inefficient, transport of traffic to and from the US.

As matters currently stand, the figures in Table 2 suggest wide variations between ISPs in the capacity per subscriber. (These variations may be caused by the need to buy capacity in quantised units and by vagaries in the reporting process.) Here it is assumed that 64 kbps downwards will suffice for 100 subscribers and 64 kbps upwards will suffice for 200 subscribers. (This ratio of capacity downwards to capacity upwards corresponds to supposing that voice over IP constitutes almost half the traffic.)

The Everest Net price for the Internet gateway service may assume that the traffic from multiple purchasers of the service (perhaps up to 3, to judge from the NTC internet gateway service price) can be aggregated within one circuit. However, the price should be related to the Everest Net costs of capacity (bought from Mercantile) and global Internet connectivity. An ISP buying capacity direct would presumably pay the Everest Net cost, not the Everest Net price; making some allowance for this suggests about $400 per month for 64 kbps downwards or upwards. For bulk purchases the going rate is actually about $300 per month for 64 kbps downwards or upwards, which, for the ratios of capacity to subscribers assumed above, leads to $3.00 per subscriber per month downwards and $1.5 per subscriber per month upwards.

To these costs of capacity must be added a tax deduction at source of 15%; this is $0.45 per subscriber per month downwards and $0.22 per subscriber per month upwards

4.3 User connection service

The user connection charges incurred by an ISP for dial-up access are the connection and rental charges for the lines from the telephone exchange to the POP. The corresponding charges for ‘always on’ access are paid direct by the user. The two sets of charges are outlined in Table 4 and Table 5.

The user connection charges for dial-up access were mentioned consistently and strongly by all the ISPs. NTC does not share with the ISPs the revenue on calls to them or even offer lower tariffs for lines for incoming calls only (as would be needed by ISPs). (In the UK such tariffing was partly responsible for the advent of 'free' dial-up access, with ISPs charging end users nothing, and for the subsequent growth in Internet use.) Proposals by the ISPs to this effect have not so far been accepted by NTC. With the current local call tariffs these proposals would have little effect on either the ISPs or NTC. However, if re-balancing leads to large increases in these tariffs, then accepting the proposals could both strengthen the finances of ISPs and reduce the costs to users.

During dial-up access (and indeed 'always on' access using a 64 kbps circuit) a user connection of 64 kbps is necessarily allocated to the access but much less traffic passes through the Internet gateway. The precise amount of traffic generated depends on the modem, what the user is doing and whether multiple users share the access simultaneously. (Indeed NTC charges extra for multiple simultaneous users, very roughly in proportion to the number of users up to 3.) In practice 9.6 kbps downwards (to the user) and 1.6 kbps upwards (from the user) is a good allocation of Internet gateway capacity for web browsing. The allocation for voice over IP depends on the codec, whether silence is suppressed and whether IP headers are compressed; again 9.6 kbps downwards (with 9.6 kbps upwards, in this case) is reasonable, for say, G.723.1 with silence suppression but without IP header compression. The assumptions that there are 100 subscribers for 64 kbps and that each user requires 9.6 kbps imply that there are 15 subscribers per user or 15 subscribers per modem; this value for this ratio (the 'contention ratio') is fairly widespread.

The ISP pays a line rental of $3.07 per month, which is the standard $2.30 together with a fee for hunting. If there are 15 subscribers per modem, the cost to the ISP is $0.20 per subscriber per month.

4.4 Equipment

If there are 15 subscribers per modem, 1 in 15 of the dial-up subscribers can be users simultaneously. This is consistent with an average demand of 28 hours of dial-up use per subscriber per month, provided that the modems are fully utilised for 15 hours per day; the differential tariffing between day and night suggests that utilisation is indeed as high as this. (For example, the WordLink tariff for night use is applicable during only 9 hours.)

The equipment (including the modems, servers, routers and VSATs) might cost $300 per active user, including duty and value-added tax;

amortising this over 2.5 years (and ignoring interest) gives $0.67 per subscriber per month.

There should be a refund of value-added tax of 10% on this, giving $0.07 per subscriber per month.

4.5 Staff

The ISPs have between 9 and 75 subscribers per employee. A low value for this ratio might apply to ISPs that are just starting or that offer other services besides internet access, but it is unlikely to be viable: NTC as a whole, for instance, has 60 subscribers per employee, and there are ISPs elsewhere with 500 subscribers per employee. (Indeed Everest Net has chosen to outsource its operations to a related company, Solutions Consultant, perhaps to reduce staff costs.) For the purposes of calculation below the ratio is taken to be 75 subscribers per employee (as attained by WorldLink).

Staff costs (salaries, pensions and so on) are $101 per employee per month for NTC, with another $77 for accommodation and $42 for administration[25]. At an ISP the average skill level required is higher than at NTC and there are other expenses (such as bills for marketing and telephone calls); however, there may be economies through the use of more efficient modes of operation. Industry estimates suggest an overall cost, including overheads, of $225 per employee per month or $3.00 per subscriber per month.

There should be a refund of value-added tax of 10% on perhaps about half of this, giving $0.15 per subscriber per month.

4.6 Summation

In the example above the ISP operates at a profit, which after payment of income tax at 30% amounts to $0.39 per subscriber per month. The costs of providing Internet access arise from:

Statutory levies, which cost the ISP $2.33 per subscriber per month (21% of the subscription, including value-added tax).

The Internet gateway service (the connection from the POP to the global internet backbone), which costs the ISP $4.50 per subscriber per month (41% of the subscription, including value-added tax).

[25] Annual Report 1998/1999, NTC, 2000.

The user connection service (the dial-up access and 'always on' connections by which users access the POP), which costs the ISP $0.20 per subscriber per month (2% of the subscription, including value-added tax).

Equipment, which costs the ISP $0.67 per subscriber per month (6% of the subscription, including value-added tax).

Staff, which costs the ISP $3.00 per subscriber per month (27% of the subscription, including value-added tax).

The subscriber also pays local call charges, besides these costs; for 28 hours these would be $8.00. When these are included, the break down of subscriber costs is as follows:

Statutory levies (12% of the overall cost to the subscriber)

The Internet gateway service (24% of the overall cost to the subscriber).

The user connection service (1% of the overall cost to the subscriber).

Equipment (3% of the overall cost to the subscriber).

Staff (16% of the overall cost to the subscriber).

ISP profit (2% of the overall cost to the subscriber).

NTC revenue (42% of the overall cost to the subscriber).

The profitability of the ISP is very sensitive to changes in the ratios of capacity to subscribers and staff to subscribers. However, the cost to the subscriber does not depend greatly on these ratios: it is dominated by the local call charges.

4.7 Government policy

Reducing the costs of Internet access does not seem central to the IT policy[26]. The Government IT policy document makes various recommendations about finance which can be summarised as follows:

An IT park will be established; participating companies will pay only 1% customs duty on software and hardware for five years.

[26] Information Technology Policy, B.S 2057, His Majesty's Government, 2000 (http://www.nepalit.com/itpolicy2000.htm).

Recommended IT training institutions will pay only 1% customs duty on software and hardware.

Domestic preference will be given to software and hardware produced within the country.

Arrangements will be made to ensure that employees are available around the clock for computer services.

A venture capital fund will be established through the joint investment of the Government ($1.3 million initially) and the private sector.

For income tax, software may be depreciated immediately and hardware may be depreciated over two years.

There may be up to 100% foreign investment in areas such as the IT park, research and development, technology transfer, and human resource development.

Foreign currency investors will be allowed to repatriate their capital and income.

The companies earning foreign currency from exporting IT software will be treated like other companies earning foreign currency.

An IT development fund will be established using Government, private sector and donor agency funds, as well as a levy of 0.5% on exported software, in order to create public awareness about IT, assist rural networking and train people.

Nepali nationals working abroad will be encouraged to invest their foreign currency earnings in IT.

5 Conclusions

Recent events in Nepal make it difficult to provide projections about how the country will develop. If it continues along the path to liberal democracy, then the suggestions made below for improving Internet use will be relevant.

The IT policy includes many actions which, when performed in a timely manner, should address several of the problems experienced by the Internet in Nepal[27]. (They deal with education and content as well as telecommunications and finance.)

Many useful recommendations, including ones like some of those discussed below, have also been proposed in a document for the National Planning Commission[28]. However, the National Planning Commission has not publicised this document widely, despite initial hopes[29].

The ambitions of the IT policy may be fulfilled but not in the time intended. They are unlikely to be fulfilled at all if the Government is obliged to treat IT organisations as major revenue sources in the short term: NTC should not be protected against pricing pressures, and the ISPs should not be treated as a mature and even malign sector which, like alcohol and tobacco, can be taxed heavily to the benefit of all.

The most significant changes in the IT industry so far have been achieved by the liberalisation of VSAT provision; this is responsible not only for the growth of the ISPs but also for the decline in incoming voice traffic adhering to the international settlements principles. In these circumstances the Government may be tempted to respond by prohibiting such services as voice over IP; however, such a response is likely to be ineffectual. A better response might be to liberalise further, by (for example) permitting voice traffic to be carried by private networks

[27] Information Technology Policy, B.S 2057, His Majesty's Government, 2000 (http://www.nepalit.com/itpolicy2000.htm).
[28] Information and Communication Infrastructure, Final Draft, Formulation of Information and Communications Technology Policy and Strategy, National Planning Commission, 2000 (http://www.joinme.net/hmtrust/dinesh/MBA/internet/universalacess.htm).
[29] NPC to make ICT Policy and Strategy public, Kathmandu Post, 20 August 2000 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2000/aug/aug20/economy.htm).

between employees of one company or, more radically, between users of one ISP. Similarly, ensuring that the second mobile network started up soon would greatly expand the take-up of mobile telephony and might provide an alternative to growing the fixed network, for voice and perhaps for internet access.

Specific suggestions are as follows:

The Nepal Electricity Authority should be encouraged to install telecommunications transmission cables whenever it installs electricity transmission cables. Use of these cables should be permitted to licensees other than NTC.

The development of privately operated public call premises and ISPs should be facilitated through decreases, not increases, in statutory levies.

Voice traffic carried by private networks and licensed public networks (including those of the ISPs) should be permitted. It is unlikely to be realistic to require a higher licence fee in return for receiving this permission.

ISPs should define and provide quality indicators so that users can choose what to buy and networks can be designed more efficiently.

ISPs should develop an Internet exchange point, perhaps in association with one of the existing VSAT providers. The development of this Internet exchange would be assisted if the ISPs differentiated themselves from each other on grounds other than price (such as quality and service offerings).

NTC should consider seriously introducing revenue sharing on calls to ISPs, to generate more traffic for itself and the ISPs, as part of the tariff re-balancing. The increased traffic is likely to compensate for the decreased revenue per call.

NTC should consider seriously providing low, distance-independent, tariffs for calls to ISPs. Using number translation (from specially-tariffed dialled numbers into typically distant geographic numbers) can let an operator route heavy or bursty Internet traffic away from bottlenecks.

6 List of references

6.1 Bibliography

Statistical Pocket Book, Central Bureau of Statistics, His Majesty's Government, 1998.

Nepal Human Development Report, United Nations Development Programme, 1998 (http://www.undp.org.np/keydoc/nhdr98/contents.html).

Economic Survey Fiscal Year 1999/2000, His Majesty's Government, 2000 (http://www.facd.gov.np/pub/ecnmsrvy2000/contents.htm).

Internet and charging in Nepal, S.B.Thapa, NTC, 2000 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.ID.02_Nepal.doc).

Synopsis of the High Level Committee Report on the Royal Palace Incident, 2001 (http://www.nepalnews.com.np/archive/2001/june/syp.htm).

Telecommunications Act, B.S 2053, His Majesty's Government, 1997 (http://www.nta.gov.np/telecom_act.htm).

Telecommunications Policy, B.S 2056, His Majesty's Government, 1999 (http://www.nta.gov.np/telecom_policy.htm).

The Internet from the Top of the World: Nepal Case Study, ITU, 2000 (http://www.itu.int/ti/casestudies/nepal/nepal.htm).

Information and Communication Infrastructure, Final Draft, Formulation of Information and Communications Technology Policy and Strategy, National Planning Commission, 2000 (http://www.joinme.net/hmtrust/dinesh/MBA/internet/universalacess.htm).

Annual Report 1998/1999, NTC, 2000.

Information Technology Policy, B.S 2057, His Majesty's Government, 2000 (http://www.nepalit.com/itpolicy2000.htm).

Report of the Secretary General on IP Telephony, World Telecommunication Policy Forum, ITU, 2001

(http://www.itu.int/wtpf/sgreport/revised version 9 march/SecGen9march_e.pdf).

Report of the APT seminar on Internet Charging, APT, 2001 (http://www.aptsec.org/astap/IP-based_Networks/Documentation/Papers/ASTAP01.EG.NM.AD.07_InternetCharging.doc).

NTC likely to lose Rs 500m in revenue, Kathmandu Post, 30 March 2001 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2001/mar/mar30/index.htm).

High taxes sounds the ISPs knell, Kathmandu Post, 28 May 2001 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2001/may/may28/index.htm).

NPC to make ICT Policy and Strategy public, Kathmandu Post, 20 August 2000 (http://www.nepalnews.com.np/contents/englishdaily/ktmpost/2000/aug/aug20/economy.htm).

Red Flag Flying on the Roof of the World, Inside the Revolution in Nepal, Interview with Comrade Prachanda (http://www.rwor.org/a/v21/1040-049/1043/interv.htm).

The Nepal Constitution of 1990: Preliminary Considerations, Himalayan Research Bulletin, Volume XI, Numbers 1-3, 1991 (http://asnic.utexas.edu/asnic/countries/nepal/nepconstanalysis.html).

Development Challenges for Nepal, M.K.Dahal, K.P.Acharya, D.R.Dahal, K.B.Bhattachan and M.K.Nepal, Nepal Foundation for Advanced Studies and Finnish International Development Agency, 1999.

Managing Internet-driven Change in International Telecommunications, R.Frieden, Artech House, 2001 (ISBN 1-58053-019-2).

Nepal Telecommunications Authority (NTA) (http://www.nta.gov.np/).

Nepal Telecommunications Corporation (NTC) (http://www.ntc.net.np/).

International Telecommunications Union (ITU) (http://www.itu.net/).

Asia-Pacific Telecommunity (APT) (http://www.aptsec.org/).

South Asian Association for Regional Co-operation (SAARC) (http://www.saarc.org/).

Nepal Net (http://www.nepalnet.org.np/).

Nepal IT (http://www.nepalit.com.np/).

Mercantile (http://www.mos.com.np).

WorldLink (http://www.wlink.com.np).

Computerland (http://www.ccsl.com.np).

Capital Online (http://www.col.com.np).

Unlimited NuMedia (http://www.unlimit.com).

HTP (http://www.htp.com.np/).

Himalayan Online (http://www.hons.com.np).

Infocom (http://www.info.com.np).

Everest Net (http://www.enet.com.np/).

Health Net (http://www.healthnet.org.np/).

Solutions Consultant (http://www.solutions.com.np/).

C&C (http://www.wdn.com.np/).

Singapore Telecom (http://www.singtel.com/)

Japan Satellite Systems (http://www.iijnet.or.jp/).

Loral (http://www.loral.com/).

Intelsat (http://www.intelsat.com/).

Teleglobe (http://www.teleglobe.com/).

6.2 Interviewees

The interviews were all conducted by Michael Dixon.

S.Joseph - Director: Voluntary Service Overseas

P.Ramsden - Manager Administration: Voluntary Service Overseas

K.Sharma - Senior Manager Operations: Nabil Bank

R.Upadhyays - IT Manager: Nabil Bank

Professor M.K.Nepal - Executive Director: Nepal Teaching Hospital, University of Kathmandu

T.Sapotka - Senior Manager: Radisson Hotel

J.Prasai - IT Manager: Radisson Hotel

Professor Dr N.Gupta - Head of General Medicine: Nepal Teaching Hospital, University of Kathmandu

C.Jackson - Economic Advisor: Department for International Development

K.Lills - Education Advisor: Department for International Development

B.Demby - Engineering Advisor: Department for International Development

M.O'Dwyer - Senior Health and Population Advisor: Department for International Development

S.Wardell - Head of Office: Department for International Development

S.Nirola - Director Tourism Products and Resources Development: Nepal Tourism Board

K.Joshy - Director Corporate Services: Nepal Tourism Board

H.K.Ayer - Manager Tourism Product & Resources Development: Nepal Tourism Board

B.J.Pradhan - Manager Information Management & Planning: Nepal Tourism Board

S.K.Singh - Administrative Manager: Everest Net

R.J.Shrestha - Managing Director: Infocom

R.Pradhan - Chief Executive Officer: Lotus Holdings

P.Tuladhar - Senior Executive: Mercantile

S.J.Bhandari - Chief Executive Officer: Mercantile Office Systems

P.S.Shakya - Director Public Relations: WorldLink

S.Agrawal - Managing Director: WorldLink

A.B.Tuladhar - Chief Executive Officer: Unlimited NuMedia

A.S.Tuladhar - Senior Executive Officer: Unlimited NuMedia

L.L.Amatya - Acting Senior Executive Engineer: Nepal Telecommunications Corporation (NTC)