



TELECOMMUNICATIONS REGULATORS' ASSOCIATION OF SOUTHERN AFRICA

Numbering Harmonization in the SADC Region

–A Briefing Paper

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Numbering harmonisation in the SADC region – a briefing paper

1 Introduction

This paper is a deliverable from TRASA's USAID-funded study of numbering harmonisation in the region. It builds on earlier stages of work:

- **An overview of the current status of numbering plans in the SADC countries.** A paper on this topic is attached as Annex 1.
- Further information on **numbering plans in the rest of Africa** is attached as Annex 2.
- **A review of numbering plan developments in other countries.** A paper on this topic "Numbering trends – a global overview" has also been prepared. It contains much background information and also explanation of terms used. Its executive summary is attached as Annex 3, and will be followed by the full paper (around 50 pages).

This briefing paper aims to bring together all this information so as to:

- Identify the implications of global trends for the SADC countries.
- Highlight relevant numbering harmonisation issues.
- Reflect comments and additional inputs resulting from the workshop held in Johannesburg in late November 2002.

Draft TRASA Guidelines on Numbering Harmonisation have now been prepared, based on members' and stakeholders' views on the recommendations in this paper. TRASA is now responsible for further work on these Guidelines and for activities relating to their content. These background briefing papers are being made available for information to all interested parties.

2 Why harmonise numbering?

The impetus behind this study was to produce a single set of guidelines to enable all the numbering plans in the SADC region to develop long-term in a harmonised way. The benefits hoped for from this include:

- Achieving numbering plans which are good for each individual country, through being user-friendly and conducive to competition.
- Making life easier for people who travel in the region and make phonecalls from different countries, by providing numbering plans which “look and feel” familiar and work as expected.
- For each country, reducing the work involved in numbering plan review and amendment, for example by suggesting codes for new services.
- Providing shared numbering space for co-ordinated use so that a single number can be called for a particular purpose throughout the region. Such numbers might be national, or might use a new international code not specific to any country. Applications might include, for example:
 - multinational companies wanting to advertise in cross-border media such as business magazines;
 - providing wide access to existing helplines (eg for AIDS);
 - carrier selection codes for pan-African carriers that would work in all the countries where they operate.
- Enhancing other efforts towards regional solidarity, unity, and economic advance, in particular by making international calls within the region or to the region easier than other international calls.

Such benefits are achievable, but naturally they come with costs. Balanced judgements are needed about which benefits are really worth pursuing in the light of costs and other priorities. Difficulties in the path of numbering harmonisation include:

- Any change to an existing numbering plan involves cost and inconvenience, both to the industry and to users. Changes should be infrequent and not undertaken lightly.
- Changing familiar codes (eg for directory enquiries) for the sake of harmonisation may benefit a minority who travel at the expense of a majority who stay at home.
- A design feature such as a closed numbering plan may not be best for a particular country, even if it is best for many other countries.
- Given that there are no powers to enforce harmonisation, it is unlikely to be universally taken up even across SADC. Arguably this reduces its value among the smaller group who do harmonise.

This paper looks at what can useful benefits be achieved at reasonable cost. Plainly, “prospective” harmonisation (looking ahead, and providing numbering for new services that do not yet exist) is a less costly undertaking than “retrospective” harmonisation (looking back, and changing the numbering of existing services).

Here, the relatively early stage of telecoms development in the SADC region, and in the rest of Africa, can be seen as an advantage. Because competition is only just starting, new services have not yet proliferated and numbering space is still relatively uncongested, SADC is well-placed for prospective harmonisation. It could set a lead for Africa and even for the world.

Much harmonisation can be achieved simply by heightening awareness among nations of the numbering choices being made. People have often chosen different codes for similar services more or less arbitrarily, not for any valid reason, but just through ignorance of what other people were doing.

3 Regional numbering

There is a view that any numbering harmonisation undertaken as a result of this study should be capable of extension into more of Africa. The question has also arisen of introducing an integrated numbering plan (like the North American Numbering Plan) for the SADC region, again with potential for including other countries.

Experience elsewhere

Other world regions have had similar ambitions. The global overview recounts experience with numbering harmonisation initiatives in Europe and Asia, and with numbering integration in many parts of the world. The lessons from this experience are:

- Regional harmonisation through common guidelines is possible, but it takes time. Progress is only visible on a 5 to 10 year timescale.
- Regional integrated numbering plans are very expensive to introduce and have limited benefits, especially for smaller countries included within them (which have to dial longer numbers than necessary, and may lose control over their international traffic). Successful numbering integration initiatives are rare¹, and there are many examples of movement in the opposite direction.
- Efforts towards an integrated numbering plan for Europe have led only to the adoption of the regional code +3883 for pan-European services (services which require a European identity rather than appearing to be associated with any one country, such as customer service offered all over Europe by multinational companies)².
- Short dialling sequences between countries (ie shorter than are achieved by normal international dialling) can be seen as an expression of regional unity. However, low tariffs for these calls (ie lower than ordinary international tariffs) are very much more important than numbering arrangements in fostering intra-regional calls.

The situation in Africa

Considering the specific situation in Africa (see Annexes 1 and 3) we see that:

- Most numbering plans in the SADC countries are already developing along lines that are consistent with global trends and best practice. The situation in the rest of Africa looks broadly similar. However:
 - There are some notable exceptions (for example Madagascar, which has restructured its numbering plan giving precedence to operator identification).

¹ Recently France has integrated the numbering of its overseas departments into the French numbering plan. Reunion is one of these (see Annex 3). As a result, callers in Reunion can dial any number in France in the same way as if they were in France, and vice versa. Charges however are international. It would be of interest to find out how this change is viewed in Reunion.

² <http://www.eto.dk/ETNS-service-types.htm> provides more detail.

- Many countries both in SADC and elsewhere in Africa have changed their numbering plans recently and may not be ready to change again soon.

We conclude that some numbering harmonisation through the use of common guidelines is possible medium-term, and that guidelines formulated to suit the SADC region would probably be equally appropriate for the rest of Africa.

- Free country code space behind +2 is scarce. There is a single free 2-digit code (+28) and a few free 3-digit codes. Three 3-digit codes have already been allocated to non-African countries. The situation is similar behind all other first digits, and new country codes (such as would be needed for an integrated plan) are hard to get.
- There is no high-level code space (ie an entire first digit, such as 7) which is vacant in all SADC countries. The best candidate for this status is the first digit 0, which is being freed in more and more countries throughout Africa. Lower-level code space (ie sequences of two or three leading digits, such as 70 or 700) is discussed below.

Abbreviated international dialling

It is possible to make numbers for calls within SADC shorter than numbers for other international calls. Abbreviated international dialling already exists on a limited scale, for example Swaziland's special short code 07 (instead of 0027) for calls into South Africa. This saves two digits. Other countries, if they chose, could use spare code space similarly for shorter dialling to specific much-called countries (which of course might be anywhere in the world). They could dedicate two-digit spare codes to this purpose and save two or three dialled digits.

Devising a co-ordinated scheme of this kind for a group of 10 or more countries rapidly leads to longer codes and less saving in dialled digits. For example, the SADC region might identify a two-digit code that they could agree to dedicate to regional dialling (say, 16³). This would then need to be followed by country identification. Because 14 countries are involved, they cannot all have a single-digit code - at least some of them must be identified using two digits. So at minimum this scheme would mean dialling 3 or 4 digits instead of the current 4 or 5 digits, for example⁴:

³ 16 is not free in all SADC countries, let alone throughout Africa. It has been chosen purely as an example of a code which it might be agreed to free for a specific shared purpose.

⁴ Please note that this is only one example, with codes chosen using the objective criteria of single digit codes for countries with population over 10m, and alphabetical order, in order to illustrate necessary code lengths for the group of 14 countries. Obviously, many alternative code allocations could be devised. This example allows room for only four more countries to join.

161	Angola	instead of	00244 saving 2 digits
162	DR Congo	instead of	00243 saving 2 digits
163	Malawi	instead of	00265 saving 2 digits
164	Mozambique	instead of	00258 saving 2 digits
165	South Africa	instead of	0027 saving 1 digit
166	Tanzania	instead of	00255 saving 2 digits
167	Zambia	instead of	00260 saving 2 digits
168	Zimbabwe	instead of	00263 saving 2 digits
1691	Botswana	instead of	00267 saving 1 digit
1692	Lesotho	instead of	00266 saving 1 digit
1693	Mauritius	instead of	00230 saving 1 digit
1694	Namibia	instead of	00264 saving 1 digit
1695	Seychelles	instead of	00248 saving 1 digit
1696	Swaziland	instead of	00268 saving 1 digit

A Pan-African abbreviated dialling scheme is possible, for example using 16 in place of 002, and reproducing the part of the country code that follows 002 (so that, say, South Africa would be dialled by 167 and Mozambique by 1658). This would provide a uniform saving of one digit. Alternatively, if it could be agreed to dedicate 0 to this purpose then two digits could be saved. This scheme would however only be accessible to countries with closed numbering plans which make no use of the first digit 0 apart from the international prefix.

Another approach is illustrated by the East African group of Kenya, Tanzania and Uganda. They have chosen to make calls among themselves two digits shorter, by making calls to everywhere else in the world one digit longer (using international prefixes 004, 005 and 006 among themselves and 000 for elsewhere). This approach is plainly limited to a closed group of at most 9 countries.

Integrated numbering in Africa?

The ultimate development in this direction is an integrated numbering plan for SADC, for example following the vacant code +28 if⁵ it could be obtained for this purpose. The next few digits would need to identify countries, in a similar way to the abbreviated dialling scheme outlined above.

If made uniform, such a plan would require a minimum of 11 digits to be dialled for regional calls (if open) and 10 digits for regional, national and local calls (if closed). The illustration above leaves room for only four new members. Longer country identification strings could permit more members but at the cost of dialling more digits for every call. Longer strings also entail a growing risk of operator identification getting too deeply embedded in the number⁶ for incoming calls to be correctly routed to each operator.

In principle, a scheme of this kind could be run as an “overlay” alongside existing national numbering plans for an indefinite period, thereby avoiding premature change in

⁵ This is a very big if. Because of the global shortage of country codes, as discussed in the global overview, it is very unlikely that the ITU would allocate the code for this purpose. The example is used here only for ease of discussion.

⁶ That is, beyond the 7 initial digits (including the country code) allowed for by ITU Recommendation E.164.

the national plans. Although theoretically possible, this would be confusing for callers from outside the region, who if offered alternative dialling sequences for a single destination might mix elements of each. It is therefore not recommended that an overlay be pursued. (In any case, understandably the ITU would be highly unlikely to grant a country code for duplicate use).

We therefore consider the pros and cons of an integrated regional numbering plan replacing national numbering plans. Main benefits are:

- A display of unity, both within the region and to the outside world.
- Uniform number length throughout the region, if implemented to achieve this. (Of course, this could also be achieved through harmonisation of national number lengths).

Main disadvantages are:

- If implemented with uniform number length, longer numbers than necessary, especially for small countries. In any case, international calls would normally require at least one digit more than at present⁷.
- High implementation cost, especially if implementation were not phased over a long period.
- If implementation were phased over a long period, long-lasting confusion for callers over which countries were and which were not part of the plan. On the natural assumption that not every eligible country would decide to join, this could create the opposite impression to the desired one of unity.

We see that there are no clear benefits of introducing an integrated regional numbering plan that cannot be achieved at lower cost by harmonisation of national numbering plans, together with the adoption (if desired) of a regional abbreviated dialling scheme. It is therefore not recommended that integrated numbering be pursued.

⁷ A Pan-African integrated numbering plan that left national number length unchanged would look very like the current arrangement, with the digit 8 inserted after 002 in all country codes.

4 Common design principles for national numbering plans

Number length and layout

When numbering plans are changed, a move towards **greater uniformity of number length and layout** has proved almost universal. This benefits operators and customers alike. It is therefore easy to suggest this as a guideline for any one country.

Standardisation of national significant number length (NSNL) between countries is a more difficult issue. Leaving aside a few tiny islands, NSNL in SADC and also in Africa ranges from 6 to 9 digits (though Nigeria's mobile numbering has recently started a 10-digit range). In principle it would be possible to standardise on a 9-digit NSNL for almost everyone; or on two NSNLs – say, 9 digits for larger countries and 7 digits for smaller countries. All but the smallest countries are likely eventually to need the capacity of at least 7 digits. However, either approach obviously means more digits being dialled than necessary, which is likely to lead to more mistakes and failed calls.

Open plans dictate a particular **layout of numbers**, as a break is necessary between the code and local number. Closed plans, however, where all digits must be dialled, permit any layout. It would be possible to promote standard number layouts for closed numbering plans of particular lengths, such as:

9 digits: xx xxx xxxx

8 digits: xxxx xxxx

7 digits: xxx xxxx

6 digits: xx xxxx

These are just examples; however they stick to the desirable principle that the end of the number should remain stable even when the plan is expanded using a prefixed digit.

Open and closed plans

Closed plans are in a clear majority over open plans in Africa (though closed and open plans are equally prevalent in SADC countries), and as elsewhere in the world they seem to be gaining ground. The global overview explores this tendency and explains why there is little movement from closed to open plans. Africa provides a good example. Most open African numbering plans started out with short trunk codes (usually of one or two digits), and recent reviews of open plans have tended to move towards combining smaller code areas, leading to shorter codes. There is usually therefore only a small difference in length between local and national numbers, a situation which is conducive to closing the plan. This has advantages of simplicity for callers, ease of capacity expansion and eventually compatibility with number portability.

However it is risky to move to a closed plan while tariff differentials are still high, as callers can lose their best source of tariff information (that is, the 0 indicating a long-distance, and therefore expensive, call).

To keep open an easy path to closure without forever dialling a redundant 0, it is wise to avoid having both area codes and short codes starting with 1. As 1xx is the world

standard range for short codes, this means taking the opportunity to move area codes out of the 1 range.

Competitive principles

The principle of **integrated geographic numbering** for all fixed network competitors is by now well-established in practically all countries that have introduced competition. This means that all competitors providing direct network access in a geographic area share the same area code, and are themselves identified by digits following this code⁸. The reasons are discussed in detail in the global overview and in section 4 of Annex 1. Briefly, they are:

- User understanding and convenience – operator identification is of much less interest than location.
- Competitive fairness – to make sure that all local calls appear equally local.
- Economical use of numbering resources – this permits number allocation in small blocks tailored to emerging demand.

The only circumstances where the alternative (of giving precedence to operator identification) might make better sense would be if it is expected that geographic identification will soon become obsolete. This is most likely in small countries with low (or no) tariff differentials between local and long distance calls.

Few African countries have yet needed to introduce **carrier selection codes**. There is therefore an opportunity for SADC to do this in a harmonised way, provided that it acts fast. Alternative long-distance operators are already on the way and will need these codes to offer indirect access. The global overview shows that the prefix approach in general is both more flexible and more widely used than its alternatives, so this seems a natural recommendation. Part of the 1xx range is the obvious choice for carrier selection prefixes. A 1xx subrange could be set aside for co-ordinated use, permitting a carrier to be identified by the same code in all participating countries.

A full set of recommendations on **carrier selection policy**, encompassing issues of carrier selection code length, carrier preselection, user solicitation and default carriers, is beyond the scope of the present study. These issues must be tied in with broader matters of competition, licensing and interconnection.

The same is true of **number portability** policy. However, it is likely that number portability (between operators in fixed, mobile and/or freephone markets) will be required in all countries at some time. In order to make its introduction easy when this time comes, the following preparations are wise:

⁸ This would apply equally to fixed, fixed-mobile, local loop and under-served area operators providing a service using cellular technology which is charged at rates similar to those for the fixed network, and which is intended to be a substitute for fixed network service in a particular geographic area.

- Ensure that the legislative and regulatory framework will enable number portability to be introduced in fixed, mobile, and freephone markets as soon as each is in the national interest. This must include providing for the costs to be covered.
- Ensure that the legislative and regulatory framework will enable number portability to be introduced in fixed, mobile, and freephone markets as soon as each is in the national interest. This must include provision for the incremental costs to be recovered by fair contributions from all concerned.
- When installing new exchange equipment or upgrading what exists, operators should be encouraged to get software which is compatible with number portability.
- Keep the situation under regular review with the industry. This could be a job for an Advisory Committee covering both numbering (see 6 below) and other technical matters. The eventual method of implementation of number portability and any applicable standards should be clarified in some such forum.

5 Specific choices of codes

The ITU-recommended trunk prefix 0 and international prefix 00 are already widely adopted in Africa, and universally in SADC (apart from Tanzania, which as already noted uses international prefix 000). This seems a sensible trend to continue. The standard abbreviation “+” (which means “international prefix”) is also in general use in GSM mobile systems.

Another ITU recommendation, of not using 0 as the first significant digit of internationally dialled national numbers, is however less universally observed. Mobile numbers in Ivory Coast, Togo, Burundi and Rwanda all contravene this principle. Because of general advice to international callers to “drop any zero at the front”, this practice carries with it a risk of misdialled international calls. It is also eating into the space behind 0 which may be the best hope for shared use. For both reasons SADC’s guidelines should reinforce this ITU recommendation.

Both SADC and the rest of Africa show a tendency, much in keeping with the rest of the world, to use earlier digits (2, 3, 4...) for geographic codes and later digits (9, 8, 7...) for mobile and new services numbering. Also like the rest of the world, they are using the 800 code (or variants) for freephone/tollfree service and 900 (or variants) for premium rate, where these services are offered; and, usually, 1xx for short codes. But that is as far as common practice goes.

Mobile numbers appear on every first digit, and are often already spilling out of the ranges originally designed for them as growth exceeds all expectations. The only realistic recommendation in this regard is to continue to focus mobile numbering on the later first digits (6 to 9), while leaving space in these ranges for other new services.

For this study, information has been gathered on short codes used in Africa for specific emergency services and operator services⁹. The results, shown in Annexes 1 and 3, show considerable variation and no common free space that could be used for harmonised codes. Use of 2-digit codes (typically 17, 18, 10 and 12) is common in Francophone countries. Unfortunately using 2-digit codes is a lavish use of a resource which is likely to become scarce, so harmonisation on these codes is not recommended.

The European and GSM standard emergency code 112 will be increasingly dialled by travellers who believe that it is a world standard. It will therefore become desirable to free it from other uses. Where it can actually provide access to emergency services, this will be good for visitors and presumably for tourism. Any existing well-known emergency codes should however be left in parallel service for as long as people are using them. The NANP emergency code 911 is also increasingly used for private emergency services and there is a case for reserving it for this purpose.

It may be useful to classify the status of short codes and indeed other service codes, possibly matching numbering ranges, for example to distinguish the following statuses:

⁹ From fixed networks only. Of course codes used from mobile networks should also be taken into account.

- All operators must provide the specified service on the specified code (eg emergency calls).
- All operators providing the specified service should use the specified code (eg fault reports).
- Free choice of services to provide on any code in a specified range.

Another important design feature is signalling to callers the price of special services. Traditionally, calls to short codes incurred no charge or only low charges, but liberalisation is leading to high charges for some special services (eg international directory enquiries in Europe). Callers' need to know the call charge ("tariff transparency") may be addressed through the number ranges, through voice announcements or through other publicity.

As for specific codes for other new services, few have been introduced in Africa as yet. SADC could take a lead here, by publicising the choices made by early adopters so that others have the chance to follow suit. It could also initiate debate about what services are likely to require new number ranges - for example, whether corporate numbering will be required, and if so what characteristics it will need.

Common and harmonised numbering

A major recommendation of this study is that the SADC countries should identify numbering space that they can use for common and/or harmonised numbering purposes. An example may be useful to help clarify these ideas.

Suppose that the NDC 600 is found to be free in all SADC countries and it is decided to develop this jointly for (say) a service that will be charged at no more than local rate in any country, with 6 digits after the code (ie as 600 xxx xxx¹⁰). At the same time it may be decided to set aside a sub-range (say 600 123 xxx) for common use. This is only 1000 numbers in the first instance, because for cost reasons a big demand is not foreseen. But an international computer company might take the number 600 123 123 to provide customer service for their computers at local rate throughout the region.

Obviously, to ensure unique allocations, records of allocations must be kept that are available to all the collaborating countries. Somebody has to be responsible for the upkeep of these records. However with suitable rules all countries can have equal access to free numbers, maybe on a first-come-first-served basis. (In principle, common numbering space could be subdivided among the countries, so that, for example, one would allocate the range 600 123 12x, another the range 600 123 2xx, and so on - but this would reduce customers' easily accessible choice of numbers, and is therefore not recommended).

This leaves all the rest of 600 xxx xxx for harmonised allocation by individual regulators. So the number 600 234 567 might be allocated to different companies for different purposes in adjacent countries, but it would still be recognisable as costing not more than local rate.

¹⁰ Note that this will be dialled as 0600 xxx xxx in countries with open plans or where this is the required format for national numbers, and as 600 xxx xxx elsewhere.

6 Regulation of numbering

The global overview showed that the regulation of numbering is itself a large and rapidly developing area of work. Compendia of rules about numbering can run to hundreds of pages, and many hours of committee meetings and consultancy study are being poured into topics like charging for numbers and number trading.

The global overview also shows that there are already well-established principles relating to aspects of numbering such as “ownership” and good husbandry, and to the good management of numbering changes, which can probably be adopted by SADC countries with little change.

The workshop confirmed the consultant’s impressions that:

- The regulation of numbering is as yet a new topic in most SADC countries – only now are regulators taking on these responsibilities and deciding how to exercise them.
- SADC regulators would welcome more transparency and outside input on numbering matters, but apart from South Africa, have yet to stir up much interest among the public.

Some other important points arose from the workshop:

- There is a real will to co-operate at the regional level on numbering matters.
- Two sets of published numbering conventions (detailed rules for managing numbering space and allocations) are available in English within the region, one in South Africa (based on an Australian model) and one in Tanzania. The Tanzanian set is relatively short and simple. Another set of relatively simple rules is available from Angola, in Portuguese.
- TRASA’s existing Numbering and Standards Committee already provides the necessary forum for policy decisions. However, because it includes representatives of all SADC countries, it can meet only infrequently. It is therefore not a suitable body for implementing policy decisions.
- In the current rapidly changing environment, speedy responses must be made to requests for numbering resources. This is already true at national level, and will equally be true at regional level if and when regional resources are identified.
- To progress numbering matters at regional level, there are three main requirements:
 - Skilled, dedicated manpower to carry out the legwork. In principle this could be located in any of the regulators’ offices, or it could be bought in. (Normal office facilities including hardware, software and communications are assumed, and should be sufficient for the time being).
 - Authority over and supervision for this manpower. This might best be supplied by a subgroup of TRASA’s Numbering and Standards Committee.

- Enhanced understanding of the issues. Existing relevant expertise in the region needs to be made available to TRASA, both from within its member regulators and from stakeholders. Further capacity-building is also desirable, especially in countries with limited experience to date of numbering issues.
- Few SADC countries are making charges for numbers, though some others are interested in pursuing this route.

7 Recommendations

These are the final study recommendations, revised in the light of feedback and debate at the workshop. They are the views of the consultant and do not commit TRASA in any way.

The recommendations below are arranged under headings that show whether they are process recommendations (for further relevant activity) or substantive recommendations (potential guidelines). Within this they are further divided according to whether they apply primarily at the regional level or primarily at national level. The references in brackets at the end of each recommendation are to the section of this paper in which the relevant issues are discussed. Topics highlighted for further study are marked **.

Process recommendations

Regional level

- PR1 Aim for long-term convergence of SADC and African national numbering plans by adoption of common design principles, and where feasible harmonised and/or common codes. (S3)
- PR2 Adopt a common regulatory approach in numbering matters. (S3)
- PR3 Introduce a regional numbering subgroup of TRASA, embodying its best relevant expertise and supported by a dedicated resource, to enable all interested countries to pursue co-ordination and publicise numbering plan changes among themselves. Invite other African countries to participate. (S3)
- PR4 **Urgently, study other aspects of carrier selection policy, in particular timetables for introducing carrier preselection and arrangements for default carrier selection (when callers have not made a conscious choice). These timetables and arrangements may vary from country to country, but only with objective justification. (S4)
- PR5 **After suitable study, announce timetables for introducing number portability in each separate market in each country (fixed, mobile and freephone). (S4)
- PR6 **Establish any scope for harmonised short codes beyond carrier identification codes, such as 100 for operator service. At the same time, reserve some short code space (free or freeable in all countries) for common regional use. (S5)
- PR7 **Study the NDC ranges 6 to 9 for any free or easily freeable space that could be used in a harmonised and/or common way across all or some SADC countries. Likely candidates may be 60(0) and 70(0). (S5)
- PR8 **Collect ideas for applications of any common numbering space that is identified. If both space and good ideas for its use are found, manage this space through the regional numbering office. (S5)

PR9 **Building on the work already done by Tanzania and South Africa (and any others that emerge¹¹), develop model Numbering Conventions, and policy in relation to charging for numbers, that will be suitable for the region. (S6)

National level

- PN1 Place numbering administration within the regulator, or devolve to an administrator, with an arm's length relationship with competing operators. (S6)
- PN2 Regulate numbering in a transparent way, publishing details of numbering plans and consulting publicly on all major issues. (S6)
- PN3 Set up a Numbering Advisory Committee, including representatives of both the industry and the public. (It could also cover other related matters, and might need a different name). (S6)
- PN4 Well in advance of the start of competition, prepare both the regulatory framework and the networks for number portability, as outlined above. (S4)

Substantive recommendations

Regional level

- SR1 Do not pursue a regional integrated numbering or dialling plan. Its main benefits will be achieved at much lower cost by the long-term convergence recommended at PR1 above. (S3)
- SR2 If at some future time additional regional numbering space is desired, apply to ITU for a "regional country code" (+3882 may be realistic) for pan-African telecoms developments. (S3)
- SR3 Where the first digit 0 is not in use (eg in countries with closed plans who are not using this first digit for other purposes), reserve this for future regional development. (S3)
- SR4 As the first digit 0 becomes available in more countries for regional development, consider the use of 0x (where x is not 0) for abbreviated regional dialling. Following 0, a standard set of one-digit and two-digit codes could cover either SADC or the whole of Africa. (S3)
- SR5 Promote standard number layouts for use in closed plans with each number length. (S4)
- SR6 Long-term, standardise throughout the region on uniform number lengths within any one country, with a choice between two national significant number lengths (9 and 7). (S4)

¹¹ Eg Angola

SR7 Following PR6 above, reserve at least one 1xx range for carrier selection codes to be allocated in a co-ordinated way to Pan-African carriers (so that a single code will work in all co-operating countries). (S4)

National level

- SN1 Adopt ITU recommendations on trunk and international prefixes 0 and 00, and on not using 0 as the first digit of internationally dialled significant numbers. (S5)
- SN2 In countries with open numbering plans, preserve the option of closing the plan when conditions are right, and reconsider this option whenever major change is in prospect. (S4)
- SN3 Ensure that the numbering plan preserves clarity to users about any significant¹² differences in tariffs, for as long as these persist. This is usually easiest if local charge areas match local dialling areas. (S4)
- SN4 For geographic numbering, use a single set of geographic codes, which appear at the beginning of the number, for all competitors. Ensure that the incumbent uses local number blocks in a disciplined way so that plenty of space is also available for competitors. Allocate suitably-sized blocks of numbers within an area code to any competitors needing local numbers in that area. (S4)
- SN5 Use earlier number ranges for geographic numbering, later for non-geographic and mobile. (S5)
- SN6 Use NDC 800 for freephone/tollfree service and 900 for premium rate service (if/when introduced). (S5)
- SN7 Use 1xx for short codes (all codes to be at least 3 digits). (S5)
- SN8 Free 112 from non-emergency uses, and plan to introduce an emergency service on this code, access to which will be implemented by all operators. Reserve 911 for emergency applications. (S5)
- SN9 Adopt the prefix approach to carrier selection codes, using codes in the 1xx range. It will aid public recognition if they can be confined to a single 1x subrange, and especially if this can be the same subrange as has been identified for Pan-African use (see SR7 above). Decisions on the lengths of carrier selection codes and criteria for obtaining a given length (where there is a choice) should be closely related to decisions on other aspects of carrier selection policy (see PR4 above). (S4)

¹² What is regarded as significant will vary. Decisions in this area should be informed by user research and consulted upon with users and their representatives.

Annex 1: Current status of numbering plans in SADC countries

1 Introduction

This annex will eventually document in detail the current status of numbering plans and policy in the SADC countries. It is part of the TRASA USAID-financed consultancy project on the harmonisation of telephony numbering plans in the SADC region. This version takes into account comments and additional information received from Lesotho, Mozambique, Namibia, Seychelles and Zambia. Further input and corrections remain welcome from any reader.

The paper contains information that has been gathered mainly from a variety of published sources (eg papers supplied by country numbering contacts to the ITU, the ITU Operational Bulletin, and telephone directories from the collection in the City of London Business Library). In addition, some countries¹³ have already provided background papers directly to the consultant, and information from these has been included where possible.

¹³ Botswana, Lesotho, Mozambique, Seychelles, South Africa, Tanzania, Zambia

2 Characteristics of the SADC countries

	country code	population (m)	Area (k sq km)	GDP per capita (\$)	GDP (\$bn)	tele density total ¹⁴ per 100 people	lines fixed (k)	lines mobile (k)
Angola	244	13.5	1,247	901	12.2	1.2	80	87
Botswana	267	1.7	582	3047	5.1	21.6	83	278
DR Congo	243	52.5	2,345	203 ¹⁵	10.7	0.9	18	450 ¹⁶
Lesotho	266	2.1	30	418	0.9	2.0	10	33
Malawi	265	11.6	94	152	1.8	1.0	54	56
Mauritius	230	1.2	2	3881	4.7	50.6	307	300
Mozambique	258	20.2	799	209	4.2	1.3	89	169
Namibia	264	1.8	823	2040	3.7	12.2	118	100
Seychelles	248	0.09	0.5	6862	0.6	71.8	21	37
South Africa	27	45.1	1,226	2882	126.2	32.4	4924	9197
Swaziland	268	1.0	17	1353	1.4	9.6	32	66
Tanzania	255	36.0	886	257	9.2	1.6	148	427
Zambia	260	10.7	753	463	4.9	2.1	85	139
Zimbabwe	263	13.7	391	487	6.6	4.3	254	329
SADC total		209.8	23,642		192.1		6269	11333
South Africa as % of SADC		21%	12%		66%		79%	81%

Figure 1: Country codes and basic statistics

Figure 1 shows the SADC countries, their telephony country codes and some basic statistics taken from the ITU (mainly referring to 2001), where not supplied directly by the countries. Points worth noting include:

- We are dealing with countries of greatly varying population, size, economic development and teledensity. Smaller (ie lower capacity) numbering plans can have shorter numbers than larger ones, making them easier to use. Physically small countries can move faster to flatter tariff structures, which fit well with closed numbering plans.

¹⁴ Fixed plus mobile connections per 100 population.

¹⁵ Taken from SADC website as ITU had no figure available.

¹⁶ 2002 estimate supplied by Vodacom, growing fast.

- It is notable that mobile lines already exceed fixed lines in most SADC countries. There is every chance that they will soon do so in all SADC countries, and that this state of affairs will be permanent.
- South Africa has a high share of the region's economic activity and telecoms lines, although not of its population or land area.

3 Basic features of SADC numbering plans

	numbering plan change date	open/ closed	maximum charge differential	Trunk prefix
Angola	1999	open ¹⁷	4	0
Botswana	in progress	closed	24	None
DR Congo	1-May-02	open	?	0
Lesotho	01-Aug-02	closed	2	None
Malawi	1-Jul-02	closed	5	0
Mauritius	1989	closed	3	None
Mozambique	Planned for 2004	open ¹⁸	15	0
Namibia	1993-2001	open	4	0
Seychelles	16-Feb-00	closed	1	None
South Africa	Planned soon	closed	2.7	0
Swaziland	01-Jan-99	closed	6	None
Tanzania	31-Dec-01	open	14	0
Zambia		open	30 ¹⁹	0
Zimbabwe	1-Jan-02	open	20 ²⁰	0

Figure 2: Numbering plan change dates and trunk dialling procedure

Figure 2 shows the date of the most recent or current major numbering plan change, and whether (after this change) the plan is open or closed. It is noteworthy that, apart from Mauritius²¹, only three of the 14 countries have not had or announced a major numbering change in recent years.

¹⁷ It is expected that the plan will need expansion around 2010. The option of closing the plan is being kept open and will be reviewed at that time.

¹⁸ Likely to change to closed in 2004.

¹⁹ 1998 figure

²⁰ 1998 figure

²¹ Which changed in 1989 and is still happy with the result.

An **open** numbering plan here means one with separate dialling procedures for local and trunk calls (ie local number only for local calls, trunk prefix (0) + trunk code + local number for trunk calls), while a **closed** plan is one with a single dialling procedure (all digits of the full national number) for all domestic calls²².

The **trunk prefix** is the digit (if any) that precedes the full national significant number when it is dialled inside the country (but not when it is dialled from abroad). In all SADC open plans, this is 0 in keeping with ITU recommendations. In closed plans, no trunk prefix is necessary. However:

- For the time being, the soon-to-be-closed South African plan will retain 0 as the first dialled digit of all calls except those to the short code range (starting with 1). This 0 will not however be dialled by callers from abroad, who are not offered access to the short code range.
- Malawi plans very soon to prefix all its current numbers (which have 6 digits) by 01 for the fixed network and 08 for mobiles. (In keeping with the ITU recommendation, as for South Africa, the 0 is not to be dialled when calling from abroad).

The column headed “maximum charge differential” shows the ratio of the charge for the most expensive national call to that for a local call²³. This is an indicator of how steeply fixed network tariffs rise with distance. When this figure is high, the trunk dialling procedure is important in alerting callers to the potentially high cost of making a call, and enabling trunk calls to be easily barred if desired. Underlying cost trends everywhere are working towards reducing this figure.

²² From the date of implementing the new South African numbering plan (expected any time now), all SADC countries will use the ITU-recommended international prefix 00 for international calls, except for Tanzania which uses 000 (to allow for regional dialling with Kenya and Uganda). Swaziland also offers short “trunk” dialling into South Africa using the special prefix 07, and has special international prefixes 05 and 06 for calls to Lesotho and Mozambique.

²³ Both for 3 minutes at peak rate.

4 Fixed network numbering

	number of geographic NDCs ²⁴	Number of local charge areas	NSNL fixed	fixed operator ID before or after geog ID	fixed NDC range
Angola	18	18 ²⁵	7	after	2, 3x-7x
Botswana	N/a	56	7	after	2 to 6
DR Congo	6	?	7, 8, 9	after ²⁶	1 to 6
Lesotho	N/a	?	8		2
Malawi	?	?	7	before	1, 2, 3
Mauritius	N/a	3?	7		2 to 8 ²⁷
Mozambique ²⁸	11	11	6, 7, 8		1 to 7
Namibia	7	239	9 ²⁹ , 8		61 to 67
Seychelles	N/a	1	6	before	2, 3
South Africa	40	940	9	after	1 to 5
Swaziland	N/a	36	7		2 to 5
Tanzania	7	34	6 to 9	after	2x
Zambia	11	25	7		1 to 6
Zimbabwe	94	?	9, 8	after	2, 3

Figure 3: Fixed network numbering

The first column in Figure 3 shows the number of geographic codes and/or local charging areas. A local charging area is the area within which a call is charged at the local rate. It is important for callers to be able to recognise when they are being charged at local rate and when at a higher rate. In a plan that has been closed for some time the notion of NDC ceases to apply, but the notion of local charging area remains³⁰. It is simplest for users if:

- In an open plan, local charge areas match NDC areas (so that trunk charges apply if, and only if, a 0 is dialled to start with – ie local charging matches local dialling). It

²⁴ NDC = National Destination Code or trunk code

²⁵ NDCs match provinces. Charging has two distance bands within a province and two outside a province.

²⁶ New operator local numbers start with 4 (except in Kinshasa, where they start with 3)

²⁷ 2, 4, 6 indicate geographic areas

²⁸ Change likely soon to 8-digit closed plan with all geographic numbers starting with 2.

²⁹ 9 digits only for DDI customers

³⁰ Until all calls throughout the country are charged at the same rate – achieved in few countries to date (but Seychelles is one such).

may not be a big problem if local charges apply only within a town rather than within a NDC, so long as town boundaries are clearly defined and there is no room for doubt about the charge rate. This may be the case in Namibia, for example. However with time, urban sprawl often muddies what used to be clear.

- In a closed plan, local charge areas match a simple combination of early digits – preferably the same first digit only, or failing that the same first and second digit.

The next column shows the national significant number length (NSNL) in use in the fixed network. This means the number of digits dialled to make a national call to these networks, but without the trunk prefix (if any). All SADC countries use between 6 and 9 significant digits for fixed network calls.

A key feature of a numbering plan is how number blocks are allocated to new competitive fixed networks. It has become standard practice in developed countries with fixed network competition for the geographic significance in numbers to be shared by all operators, so that operator identification comes after the area code³¹. Some SADC countries have also adopted this approach, while others have yet to decide how they will address this issue. Placing the operator identification before the geographic code, as is contemplated in Malawi, is usually popular with operators but has some serious disadvantages, for example:

- Users generally dislike it. They prefer to focus on geographic information, with its implications for call charging. At the same time it limits the scope for operator number portability, thereby ultimately limiting competition.
- It can also lead to poor number utilisation, as all operators are allocated the same amount of space, although they may have very different numbering requirements.

The last column shows the ranges (first significant digits) used for geographic numbering. In all SADC countries except Namibia (which inherited part of South Africa's old numbering plan), geographic numbering starts with codes 1 or 2. In most countries it proceeds using the following first digits (3, 4...).

³¹ The distinction disappears in closed plans with flat tariffs where geographic codes are no longer significant (eg Hong Kong).

5 Mobile numbering

	NSNL mobile	mobile NDC range
Angola	8, 9	9x
Botswana	8	7
DR Congo	7, 8	8x, 9x
Lesotho	8	5, 6
Malawi	7	8, 9
Mauritius	7	25, 42, 49,7
Mozambique	8	82, 83
Namibia	9	81
Seychelles	6	5, 7
South Africa	9	82 to 85, 72 to 75
Swaziland	7	60, 61
Tanzania	9	74x
Zambia	8	9x
Zimbabwe	9	7x

Figure 4: Mobile numbering

Figure 4 shows the number lengths and ranges used for numbering mobile networks and their subscribers. All SADC countries use distinctive number ranges for mobile. This is important not only for inter-operator routing purposes, but to alert callers to the call charges, which are often significantly higher than calling to the fixed network. Increasingly, also, international calls to mobiles are being charged at a premium; distinctive numbering is necessary to enable this to happen.

Mobile numbering tends to use the later first digits (9, 8 or 7) which are free from geographic numbers, though Swaziland uses 6 and Seychelles 5.

We have been looking at the numbers used by people making calls to mobiles. Thinking now about numbers used by people making calls from mobiles, the picture is still quite varied (though even more incomplete). In open numbering plans, mobile service providers sometimes permit a form of “local dialling” among their own subscribers – where the full national number need not be called, just the subscriber number. Normally, however, it is possible to make the same call for the same charge using the full national (or even international) number, and it is clearly desirable to keep these options available for the sake of users who are accustomed to them.

Mobile service providers often offer special services to their customers on short codes which may differ from those used on the fixed network. Information on these mobile short codes is provided in section 7 below.

6 New services numbering

	new services range ³²	carrier selection codes	Free 1x ranges	Notes
Angola	060 data, 077 VSAT, 01x cards, 0808 country direct	10xx	13,14,16 to 19	12x reserved for local special services 070x closed user groups
Botswana	800		11,12,15 to 18	
DR Congo			?	
Lesotho	8		18	
Malawi			11 to 18	
Mauritius	800 xxxx, 3xx		not 11, 15, or 17	5xx for wireless local loop fixed service
Mozambique			15, 16, 19	
Namibia	0886 xxxx virtual telephony		none ³³	local ranges 17 for public phones, 69 for VSAT
Seychelles	40 centrex	01, 02	none ³⁴	Freephone 800
South Africa	07, 08, 1	14xx ³⁵	11 to 19 ³⁶	06, 09 reserved for PSTN, 07 for mobile expansion
Swaziland	8		10, 12 to 19	
Tanzania	07, 08, 09	1, 4 ³⁷	15 to 19	05 reserved for corporate numbers Freephone 800, premium rate 0900 ³⁸
Zambia			11 to 19	
Zimbabwe	07, 08, 09	4xx	14, 16 to 19	05, 06 reserved for corporate numbers

Figure 5: New services numbering and carrier selection codes

³² As dialled (ie with trunk prefix if applicable)

³³ All 1x ranges in use/reserved for short codes for faults, complaints, new applications, enquiries, test a number etc.

³⁴ All 1x ranges in use for short codes (but not all heavily used)

³⁵ Proposal, not yet finalised

³⁶ All ranges provisionally allocated by ICASA.

³⁷ Inbound international carrier selection, dialled between country code and national number (“to be reviewed”)

³⁸ Other early designations also made, eg personal numbering 070, paging 076, multimedia 0901

Figure 5 shows the ranges, if any, that have been identified for numbering new services other than mobile. There may be scope here for future harmonisation. Again there is a focus on the later first digits which are free from geographic use, though first digit 1 (inaccessible from abroad) is also under consideration for new services in South Africa. The main specific services with identified numbering ranges are freephone/tollfree and virtual telephony.

The second column shows the ranges that have been identified for call-by-call carrier selection codes, which enable callers to choose a long-distance or international carrier for a call in the absence of carrier preselection, or to override a preselection for a particular call. This is a relatively promising area for future harmonisation, probably using vacant and little used 1xx ranges. Vacant ranges are shown in the next column – unfortunately, there is no common empty space.

Two countries have designated numbering space for corporate numbering, possibly on the model of the UK which is about to consult on opening a range of this kind. It is for discussion how much demand exists for this type of numbering in Africa and what provision should be made for it.

7 Short codes

	general emergency code	police code	fire code	ambulance code	operator assistance code ³⁹	directory enquiries code ⁴⁰
Angola		113	115	116	109	112
Botswana		999	998	997	100	192
DR Congo						
Lesotho		123	122	121	100	151
Malawi	199, 112				100	191
Mauritius		112	115	114	10091	150
Mozambique	22334 ⁴¹				180	181
Namibia	1199	10111 ⁴²	211111 ⁴³	211111	1199	1188
Seychelles	999, 112				100/105	181/185
South Africa	1022 ⁴⁴	10111	10178 ⁴⁵	999 ⁴⁶ , 10177	1025	1023
Swaziland		999	404 3333	933	90	91
Tanzania	112				100	118, 135
Zambia	999				100	102
Zimbabwe	112, 999	113, 995	114, 993	115, 994	150	100

Figure 6: Special short codes

Figure 6 shows selected short codes for emergencies and commonly called services, as used from fixed networks, which in principle could be candidates for harmonisation across the region. There is a clear convergence on the 1xx short code, but within this there is considerable variation.

The limited information available to this study on short codes used from mobile networks is reproduced below.

³⁹ For national calls, where there is more than one operator assistance code

⁴⁰ For national directory enquiries, where there is more than one directory enquiries code

⁴¹ Example – varies by location

⁴² 10111 is only applicable to the bigger towns, smaller towns have their own numbers.

⁴³ 211111 is only applicable to the capital city Windhoek. Every town uses a different number.

⁴⁴ An amendment to the Telecommunications Act in November 2001 declared the 112 emergency number as the national emergency number for SA. Several private emergency service organisations provide value-added emergency assistance services using mobile network numbers. The Vodacom network supports the Netcare emergency assistance service (number 082 911, accessible from all networks) and the ISOS international emergency rescue service (number 147 accessible on the mobile network only).

⁴⁵ Code allocated but not yet implemented.

⁴⁶ Johannesburg only

Econet in Lesotho provides the following short codes:

- 112 GSM MOU emergency
- 123 Voicemail retrieval
- 133 Recharge voucher load
- 155 Administration menu
- 174 Voicemail service
- 177 Call centre

Vodacom in Tanzania provides the following short codes. Similar, but not identical, use is made of the 1XX range by Vodacom operations in Congo, Lesotho, South Africa and Mozambique. Other mobile operators in some SADC countries are said to provide short codes in other ranges, eg 4xx and 6xx. 0xx, where available, is also heavily used by some mobile operators for internal short codes (eg system testing).

- 100 Vodago recharge
- 101 Vodago balance enquiry (voice)
- *100# Vodago balance enquiry (displayed)
- 118 Directory enquiries
- 119 Dropped calls
- 111 Customer care (English)
- 112 Emergency services
- 114 SMS Service Centre Number
- 116 Friends & Family call centre number
- 121 Voicemail retrieval
- 131 Voicemail deposit
- 161 Customer care (Swahili)
- 150 Promotion query line
- 155 Infotext
- 156 Simba Competition line (infotext)
- 157 Big Brother line
- 17X Reserved for SMS billing codes

Annex 2: Numbering plans in other African countries

1 Summary of allocated country codes starting in +2

Two-digit codes

+20	Egypt
+21	three-digit codes
+22	three-digit codes
+23	three-digit codes
+24	three-digit codes
+25	three-digit codes
+26	three-digit codes
+27	South Africa
+28	free
+29	three-digit codes

Three-digit codes

x	+21x	+22x	+23x	+24x	+25x	+26x	+29x
0		Gambia	Mauritius	Equ Guinea	Rwanda	Zambia	St Helena
1		Senegal	Liberia	Gabon	Ethiopia	Madagascar	Eritrea
2	Morocco	Mauritania	Sierra Leone	Congo	Somalia	Reunion	
3	Algeria	Mali	Ghana	DR Congo	Djibouti	Zimbabwe	
4		Guinea	Nigeria	Angola	Kenya	Namibia	
5		Ivory Coast	Chad	Guinea Bissau	Tanzania	Malawi	
6	Tunisia	Burkina Faso	CAR	Diego Garcia	Uganda	Lesotho	
7		Niger	Cameroon	Ascension	Burundi	Botswana	Aruba
8	Libya	Togo	Cape Verde	Seychelles	Mozambique	Swaziland	Faeroes
9		Benin	Sao Tome	Sudan		Comoros/Mayotte	Greenland

2 Basic characteristics of numbering plans in other African countries

Figures 1 and 2 on the following pages summarise some basic characteristics of numbering plans in other parts of Africa. The information has been gathered from various sources, but mainly the ITU website and Operational Bulletins. Corrections and updates would be very welcome.

Abbreviations used are:

CAR Central African Republic

NSNL national significant number length (excluding any trunk prefix)

NDC national destination code (excluding any trunk prefix)

VSAT very small aperture terminals (satellite service)

ATM asynchronous transfer mode (data transmission protocol)

A blank means no information available, while a hyphen means “none” or “negligible”.

Not shown in the Figures, but worth noting, are the facts that:

- 0 is used as the trunk prefix in all open plans in Africa.
- 00 is used as the international prefix in all of Africa except Cape Verde (0), Guinea-Bissau (099), Nigeria (009), Somalia (16), and Kenya/Tanzania/Uganda (000).

3 Short codes in other African countries

The table below summarises such information as it has been possible to gather at a distance⁴⁷ (mainly from telephone directories of varying dates) on basic short codes in use in other African countries. There is some commonality of choice, especially among Francophone countries, but still quite a lot of variation even there.

	general emerg- ency code	police code	fire code	ambul- ance code	operator assistance	directory enquiries
Algeria		17	14		10	19
Ascension					100	181
Benin		17	18		15	12
Burkina Faso		17	18		10	12
Cameroon		17	18		10	13
Cape Verde		132	130	131	101	102
Cen Afr Rep		17	18			
Comoros		17				12
Congo		17	18		10	12
Egypt		122	125	123	10	140
Ethiopia					1x	
Gambia		17	18	16	100	151
Ghana	999	191	192	193	100	105
Guinea		117	118	119	114	
Ivory Coast		111	180	185	160	120
Kenya	999				900	991
Madagascar					10	
Mali		17	18	15	120	122
Mauritania		17	18			12
Morocco		19	15			16
Nigeria		199	999	999	190	194
Reunion	112	17	18	15	3123	12
Sao Tome					100	103
Saint Helena	999				100	
Senegal					16	12
Togo		117	118	185		
Tunisia		197		190	1717	1200
Uganda	999					

⁴⁷ Countries whose directories were examined but appear to contain no short codes for the selected purposes are: Guinea-Bissau, Equatorial Guinea, Burundi. No directories have been found for: Chad, Diego Garcia, Djibouti, Gabon, Eritrea, Liberia, Libya, Mayotte, Niger, Rwanda, Sierra Leone, Somalia, Sudan.

	Country code	population (m)	GNP per capita (\$)	teledensity per 100	open/closed	NSNL fixed	NSNL mobile	mobile NDC range	fixed NDC range	new services range	change date
Neighbours											
Burundi	257	6.9	120	0.6	Closed	6	6	29, 9	2 to 5		
CAR	236	3.8	312	0.6	Closed	6	6	0, 5, 6			Feb-01
Congo	242	3.1	1019	5.5	Closed	7	7	4 to 7	2, 3, 5, 8		
Kenya	254	31.3	360	2.6	Open	9	9	7	2, 4, 5, 6	8, 9	Sep-02
Rwanda	250	8.0	236	1.1	Closed	5, 6	8	08	5, 6, 7, 8		
Uganda	256	22.5	250	1.7	Open	8	8	7	1 to 6	8	
North Africa											
Algeria	213	31.1	1613	6.4	Closed	8	8	61, 7	2, 3, 4		
Egypt	20	64.6	1424	14.6	Open	8, 9		10, 11, 12	1 to 9	800, 900 ⁴⁸	
Libya	218	5.6	5944	11.8	Open	9	9	91	2 to 8		
Morocco	212	30.4	1160	19.6	Closed	8	8	6, 70	2, 3, 4, 5	8, 9	Oct-00
Tunisia	216	9.7	2050	14.9	Closed	8	8	9	7	8, 184 special info	Oct-01
East Africa											
Djibouti	253	0.6	846	2.0	Closed	6	6	8	2 to 4		
Eritrea	291	3.8	191	0.8	Open	7	7	17	11 to 16		
Ethiopia	251	64.5	106	0.5	Open	7	7	9	1 to 8		
Somalia	252	9.1			Closed	5	5				
Sudan	249	31.8	364	1.8	Open	8	8	123	1 to 8		Mar-99
Indian Ocean											
Comoros	269	0.7	382	1.2	Closed	6	6	-	7	3, 4, 5, 8	
Diego Garcia	246	-			Closed	4					
Madagascar	261	16.4	243	1.3	Closed	9	9	3	2		Oct-97
Mayotte	269	0.1		7.0	Closed	6	6	65-69	60-62		
Reunion	262	0.7			Closed	9	9	69	26		Jun-01

Figure 1: Basic characteristics of numbering plans in parts of Africa

⁴⁸ Special codes: 19 VSAT, 63 ATM; 707, 777: free internet

	country code	population (m)	GNP per capita (\$)	teledensity per 100	open/closed	NSNL fixed	NSNL mobile	mobile NDC range	fixed NDC range	new services range	change date
West Africa											
Benin	229	6.5	369	2.9	Closed	6	6	90-92			
Burkina Faso	226	12.2	187	1.1	Closed	6	6	2, 6, 8	3-5, 7-9		
Cameroon	237	15.2	664	2.7	Closed	7	7	7, 9	2, 3		Oct-01
Chad	235	8.1	182	0.4	Closed	6	7	8	5		
Equ Guinea	240	0.5	1290	4.7	Closed		5	7			
Gabon	241	1.3	3999	13.0	Closed	6	6	24-26			
Gambia	220	1.3		5.8	Closed	6	6	75-79, 9	2 to 74		
Ghana	233	20.9	372	2.1	Open	8	8	28			
Guinea	224	8.0	677	1.0	Closed	6	6	11-13, 40			
Guinea-Bissau	245	1.2	238	1.0	Closed	6	6				
Ivory Coast	225	16.4	818	6.3	Closed	8	8	0		001x Country Direct	Jan-00
Liberia	231	3.0			Closed	6	6	28, 4, 5, 6	33, 22		
Mali	223	11.7	225	0.8	Closed	7	7	6	2	7xxx	Jun-02
Mauritania	222	2.8	368	1.0	Closed	7	7	6	5		Mar-01
Niger	227	11.2	171	0.2	closed	6	6	90	4, 5, 6, 7	86	
Nigeria	234	116.9	346	0.7	open	8	9, 10	90, 80	1 to 9		
Senegal	221	9.7	512	6.5	closed	7	7	6	8, 9	628 special info	Oct-97
Sierra Leone	232	4.9	131	1.0	open	5, 8	8	23, 30, 76	2 to 5		
Togo	228	4.7	282	3.1	closed	7	7	9, 0	2 to 7	8	Oct-01
Atlantic Ocean											
Ascension	247	1k			Closed	4	-	-	2, 3, 4, 6		
Cape Verde	238	0.4	1356	21.5	Closed	6	6	9			
Sao Tome	239	0.2	236	3.6	Closed	7	7	90			
Saint Helena	290	6k			Closed	4					

Figure 2: Basic characteristics of numbering plans in West Africa

Annex 3: Executive summary of “Numbering trends – a global overview”

Pressures on numbering plans include:

- growth in demand both for fixed lines and for numbers required per line;
- many new non-geographic services, especially mobile but also specially tariffed services like freephone, requiring distinctive numbering;
- market liberalisation, requiring fair access to numbering resources for all competitors;
- newly aware and demanding consumers.

New technology provides new freedom in the design of numbering plans. Cost-benefit considerations show that this freedom should be used to make plans as user-friendly as possible.

1 Requirements of numbering plans

Users generally value numbers:

- **for making calls correctly.** This means short numbers, infrequent changes, and uniform number patterns.
- **for receiving calls correctly.** Users prefer to keep their own number when moving locally or when changing local operator.
- **for deciding whether to make a call.** This means that the first few digits should give easily recognisable information (eg on likely call cost).

Network operators want the plan to promote:

- **economical network operation:** this means it should conform with network constraints, and should change infrequently;
- **traffic stimulation:** this means it should be customer-friendly, and number supply must be plentiful;
- **fair competition:** the scheme should be managed fairly by the regulator.

Competitive requirements include:

- **local number capacity** for new fixed network operators in each area where they plan to operate.

- **mobile numbering capacity** for mobile operators. This is usually allocated within ranges that the public recognise as meaning “mobile phones” (and higher charges apply).
- **carrier selection codes** for indirect long-distance carriers, to enable their services to be accessed call-by-call.
- numbering **capacity for new services**.
- access to **short codes** on similar terms to the incumbent.
- **operator number portability**.

2 Developments at world level

Demands for country codes have increased greatly in recent years for new countries, new non-geographic global services, new global networks, and regional groupings. ITU's Study Group 2, who are responsible for this limited resource, are therefore reviewing the use of country code space.

The ITU E series of recommendations (led by E.164) has enabled the world's telephone networks to connect and route international calls. As a result:

- international significant numbers are limited to 15 digits, with at most the first 7 of these needing to be analysed for routing and charging purposes;
- The trunk dialling prefix 0 is now almost universal, where a trunk prefix is used at all. The main exceptions are a few CIS countries still using 8, and the NANP which uses 1.
- The international dialling prefix 00 is now very widespread. Exceptions include Japan (010), the NANP (011), Australia (0011), a few CIS countries (810), East Africa (000).
- Countries which use zero as a first significant digit (diallable internationally) risk receiving misdialled calls from other countries.

3 Developments at regional level

Harmonisation of numbering plans, making them more similar and therefore easier to use, is pursued in two main ways:

- By the adoption of common principles for numbering plan design.
- By identical or similar choices of code for special services and new services.

Both are long-term undertakings. Changes are rarely thought worthwhile simply for reasons of harmonisation. But if changes are needed anyway for reasons of capacity or

competition, then groups of countries often prefer to make those changes in a harmonised way.

Emergency codes are especially important. Arguably, a familiar emergency codes should never be withdrawn as it may be the only thing people remember in a crisis.

Regions that have addressed these issues include Europe, through the ETO, South Asia, through SATRC and the broader Asia-Pacific region through APT.

The major successful example of an integrated numbering plan is the North American Numbering Plan. The United States of America, Canada, and several Caribbean countries have a uniform integrated numbering plan behind the single-digit country code +1. This constitutes the only major world region which seems unlikely to move towards conformity with ITU recommendations.

Other examples of numbering integration can be found in Germany, Korea and France. But examples of movement away from numbering integration are much more numerous, including:

- new codes for: the breakups of the former Soviet Union and Yugoslavia; the splits of Czechoslovakia and Pakistan; the independence of East Timor, Namibia and Eritrea; the Palestine Authority, and 4 small countries in Europe;
- abandonment of attempts at integration in North and East Africa;
- Hong Kong's return to China without change to its numbering plan.

In the early 1990s, much effort was devoted to exploring the prospects for an integrated European numbering plan, on the NANP model. This was finally abandoned on grounds of excessive cost. In its place is the +3883 ETNS (European Telecoms Numbering Space).

Advantages of independent country codes and numbering plans include:

- Numbers can be shorter.
- Codes can be chosen to suit local circumstances.
- There is more freedom to choose the routing of inbound international traffic.
- The plan can be expanded as and when required locally.

An alternative way to make international calls look like national calls is to provide special dialling codes for countries which are nearby, or with which there is a special relationship.

4 Numbering plan design

Designing a numbering plan with the right capacity is an art, not a science. The need to plan long-term leads to huge uncertainties which often swamp any apparent near-term clarity.

In theory, a NSN length of n digits yields 10^n numbers, but not all of these numbers can be used. This is for several reasons, most significantly because of structure which provides useful information but inevitably leads to inefficiency. Typically, utilisation of 40% might be thought reasonable for individual geographic numbering areas. Much lower utilisation is likely for entire geographic numbering plans. Higher utilisation of up to 80% may be achieved in non-geographic number blocks.

It is very hard to predict number demand accurately. The ETO has produced guidelines on numbers per person for planning in Europe. The sensible approach for numbering planning in low teledensity countries must be to build on a realistic vision of the country's state of development and per capita income in 20 or 30 years' time.

The obvious answer to capacity problems is just to add a digit, or even two digits, to the national number length. However, every extra digit dialled increases errors, so countries need to think carefully before adding digits, especially when their populations are large and their income levels low.

5 Developments at national level

A common feature of numbering plan reviews has been simplifying geographic structures, often combining two or more small geographic code areas into one large one. This is quite a costly exercise but has several advantages.

Regular review of geographic NDC utilisation is essential to ensure that relief plans are always in place for areas which may exhaust. For each area at risk of number exhaustion within the next decade, decisions are needed on number conservation measures (if any), and on a capacity expansion path, with appropriate number ranges reserved for the purpose.

Several world cities have by now moved to 8-digit local numbers. They include London, Paris, Tokyo, Beijing, Rio de Janeiro and Mexico City. Others which have stayed with 7-digit local numbers (including all large cities of North America) have been obliged to introduce additional codes.

The main advantages of an open scheme (one with separate local and trunk dialling procedures) are that customers can dial shorter numbers for local calls, and that geographic area identities are maintained (together with the associated tariff indications). The main advantages of a closed scheme, on the other hand, are a uniform dialling procedure for all calls, and a higher possible capacity utilisation. Also, the trunk prefix is usually no longer needed, and if it is dropped, one dialled digit is saved on national calls.

In many larger countries with longer numbers, open schemes remain and may well do so indefinitely. But the balance of advantage is moving towards closure, as increasingly:

- a high proportion of calls is in any case dialled with a full national number (often in part because of a rise in calls to and from mobile phones);
- many people use dialling aids (eg memory phones) and so are little affected by the number of digits required for a call;
- there is little difference in cost between a local and a long-distance call, so no effort need be spent on finding out the exact tariffs⁴⁹.

The closure option is one that most countries will want to keep open in case it looks desirable at some future time.

Nearly all countries with access network competition (including the NANP) have decided that for both competitive and human factors reasons, all competitors must share the same set of geographic codes. Otherwise, users may get confused by rival geographic code structures, new competitors are at a disadvantage because calling them looks as if it is long-distance rather than local, and operator number portability is hampered.

Operator number portability in the fixed network has become a standard requirement in high teledensity countries with fixed line competition. Portability makes it much easier for customers to switch operator, and is widely seen as a desirable way to “oil the wheels” of competition. Operator portability is also of interest between mobile networks and between providers of special services such as freephone.

Carrier selection means enabling customers to choose who carries their long distance or international calls, regardless of which local network they are connected to. Decisions needed include:

- the choice of codes (and their placement in the dialled digit sequence) for **call-by-call carrier selection**. Prefix, insertion and substitution approaches are all in use. The prefix approach offers most flexibility and is preferable long-term.
- introduction of **carrier preselection** (ie ability for a user to nominate his own default carrier when no call-by-call selection is made);
- **default procedure for carrier selection** when the customer has not made a conscious choice of carrier.

There is little pattern in codes chosen for specific new services. The most popular choices of code for non-geographic services seem to be:

- first significant digit 1 or a late digit (especially 9, 7, or 6 for mobile, 8 for specially tariffed services);
- second significant digit 0 - the X0 and especially the X00 series. The best examples are 800 and 900.

⁴⁹ The actual tariff differential which is low enough to be negligible will vary according to the absolute level of tariffs, income levels and doubtless other factors. User research will be needed to find what it is. It would be surprising if it exceeds 2 in Africa.

Using the 1xx range for short codes is common, though not universal. This range has been the focus of many harmonisation efforts. To date the only widespread success is implementation of the general emergency code 112 across Europe and by many GSM networks worldwide. Use of 1xx and especially the 10x subrange for carrier selection codes is also common.

6 Regulatory aspects

There is very widespread agreement that:

- the national telephony numbering plan is a national resource;
- it should be managed in the overall national interest;
- in a competitive environment, the regulator needs to make sure that this happens.

Regulators do not need to take on the day-to-day running of a numbering scheme, but they must:

- maintain a long-term vision for the numbering scheme, taking responsibility for the choice of scheme architecture.
- regularly consult all interested parties, with particular concern for users.
- decide on and make public the basic rules governing the use of the numbering scheme.
- allocate number blocks to network operators, observing the principles of good husbandry.
- set rules for related competitive issues, in particular, carrier selection, operator portability, and number information databases and services.
- resolve any disputes.

New telecoms legislation or regulations should establish a system of rights and obligations covering:

- overall national **ownership** of numbers, enabling the regulator to control use of the numbering plan in the national interest.
- **allocation** (rental) of number blocks to network operators and maybe service providers, subject to reasonable conditions.
- **rights of use** by service providers and end customers.
- a clear understanding of **intellectual property** in numbers.

- a framework to permit **trading** in individual numbers.

The plan itself, any rules relating to it (often referred to as “numbering conventions”) and allocations from it should be clearly documented and a matter of public record. Exactly what rules are needed will vary – while some countries have long and complex documentation, others find a short and simple collection of rules enough.

Regulators in many countries have found Numbering Advisory Committees useful. These comprise industry experts and sometimes also user representatives and/or independent experts such as academics.

When considering options for the future of a numbering plan, important factors include:

- providing adequate numbering capacity (in both quantity and quality) for all foreseeable needs for the chosen planning period;
- being evolutionary, not revolutionary - ie being realisable through a step-by-step migration path from the status quo;
- long term flexibility;
- the ability to provide parallel running and changed number announcements (normally achieved by avoiding overlap of number ranges between old and new numbering plans).

In high-teledensity countries there is usually a desire to delay change for as long as possible. Low teledensity countries, on the other hand, especially if they are small, may do better to change their numbering plan sooner rather than later.

A checklist of numbering change implementation requirements includes:

- changes to exchanges of different types, including recorded announcements for misdialled calls.
- changes to operational support systems (eg directories, any computer system holding telephone numbers).
- carefully thought out publicity programmes for international correspondents and the general public.
- a period of parallel running of old and new plans, to enable large business systems to be reprogrammed gradually.
- support for changes to customer premises equipment, especially payphones and automatic alarms.