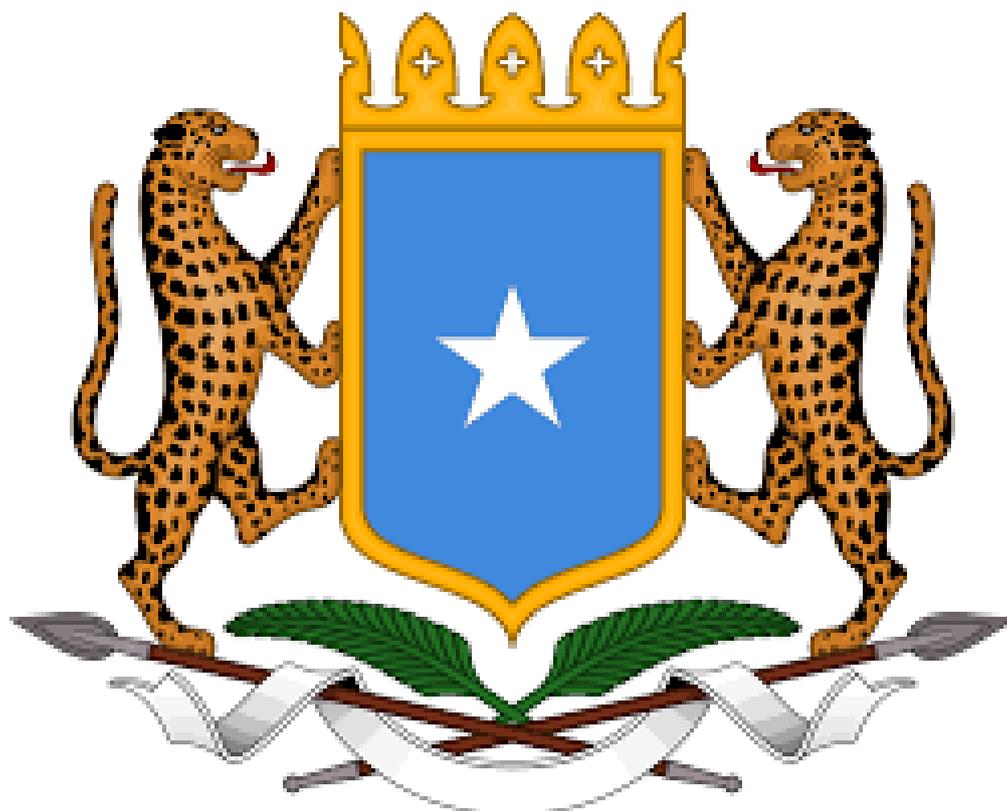


**REPUBLIC OF SOMALIA**

**MINISTRY OF POSTS, TELECOMMUNICATIONS AND TECHNOLOGY**



**NUMBERING REGULATION DISCUSSION PAPER**

**20 FEBRUARY 2018**

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## Abbreviations

CC	Country Code
CLI	Calling Line Identity
DNS	Domain Name System
ETSI	European Telecommunications Standards Institute
EU	European Union
GSM	Global System for Mobile communications
IOT	Internet Of Things
IP	Internet Protocol
ISN	International Significant Number
ISPC	International Signalling Point Code
ITU	International Telecommunication Union
MCC	Mobile Country Code
MNC	Mobile Network Code
MPTT	Ministry of Posts, Telecommunications and Technology
MVNO	Mobile Virtual Network Operator
NANP	North American Numbering Plan
NCA	National Communications Authority
NDC	National Destination Code
NGN	Next Generation Network
NSN	National Significant Number
NSPC	National Signalling Point Code
OTT	Over-The-Top
SIM	Subscriber Identity Module
SN	Subscriber Number
UK	United Kingdom
UPT	Universal Personal Telecommunications
US	United States
USSD	Unstructured Supplementary Service Data
VOIP	Voice Over the Internet Protocol
WB	World Bank

# 1 Background

## 1.1 Intention

This paper provides recommendations for numbering in Somalia, covering in particular planning the use of numbers and regulating the allocation of numbers. It is accompanied by a draft Numbering Plan, a draft Numbering Regulation and draft Numbering Forms. These provide details that fill out the recommendations and the National Communications Act, 2017.

The National Communications Authority (NCA) is to be responsible for numbering in accordance with the National Communications Act, 2017. This requires the current uses of numbers to be properly recorded. The claims for numbers discussed in this paper are not detailed enough to constitute this record, which would be a draft Numbering Register.

All of these documents take account of opinions and information already provided in discussions and correspondence, but they might need revision when comments are received. Comments (with reasons for agreement or disagreement) are invited on all aspects of them, especially the recommendations. For convenience, the recommendations are reproduced in Section 2, together with the page where each is considered.

Responses should be in English. They might be shared with other interested parties unless they are marked as confidential.

Some of the work in preparing these documents, by Robert Milne and Claire Milne of Antelope Consulting International LLP ('Antelope Consulting'), was supported by the International Telecommunications Union (ITU) and the World Bank (WB).

## 1.2 Scope

Most of this paper deals with phone numbers which are dialled when customers make calls. These are the numbers that customers read, remember, write and dial<sup>1</sup>.

There are also internal network codes, which are not used by customers and which therefore do not need to be easy to use by customers; they, too, might need international or national conventions so that networks can interwork. The most important of these are International Signalling Point Codes, National Signalling Point Codes and Mobile Network Codes, but there can be others<sup>2</sup>. The Numbering Regulation applies equally to these internal network codes.

## 1.3 Motivation

As demand for mobile phones in Somalia develops, so does demand for mobile phone numbers. When the wider economy grows there may be new demands for other kinds of numbers, such as those for freephone and other special services, or even machine-to-machine communication.

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<sup>1</sup> The term 'dial' is used for historical reasons; many current users of key pads, touch screens and pointing devices have never seen, let alone operated, a rotary telephone dial.

<sup>2</sup> The Mobile Station Roaming Number (MSRN) needed when a mobile call roams outside Somalia can be a mobile number already allocated to the network inside Somalia. However, the Routing Number (RN) identifying the destination of a call to a ported number is an internal network code attached to the ported number, not a number that a customer could dial successfully.

So far numbering has catered to demand through informal arrangements between the established network operators. The operators have chosen their own ranges of number to avoid clashes and have changed the numbers assigned to customers to improve operations. No organisation has been responsible for documenting the choices of range and ensuring fair treatment for potential new operators. The arrangements appear to have confused customers and will therefore have hampered the growth of the operators and services. The recommendations in this paper are intended to make the arrangements less confusing (and, consequently, more formal) while remaining relatively simple.

Respondents are asked to check that the recommendations are appropriate to the Somalia environment and likely to be helpful to the general public.

## 1.4 Overall position

The main conclusions of the review are:

- An inventory of the numbers that are currently allocated to operators should be formed immediately.
- Many numbers that are allocated to operators but not assigned to users should be withdrawn immediately.
- Assigned numbers need not be changed, if the information already provided is complete and no numbers are allocated before the inventory is formed.
- There will be plenty of numbers for all foreseeable requirements for current and future services, if the management is effective and the demand for fixed numbers is confined.
- Effective management should be introduced to avoid clashes between numbers and wasteful allocations of numbers.

## 1.5 Terminology

This paper uses the following terms, many of which come from ITU-T Recommendation E.101:

- The numbering plan specifies the intended use and length of all national numbers. It applies to all operators and is meaningful internationally. It also covers national-only numbers (such as short codes) which cannot be accessed from outside the country. Numbering plans change infrequently, following consultation.
- The numbering register specifies the numbers that the regulator has allocated to each operator (or to each purpose, where all of the operators have to implement access to the number). The numbering register is changed in response to successful requests to be allocated numbers; as such it conforms with the numbering plan but has extra details<sup>3</sup>.
- A National Destination Code (NDC) is the digit or digits identifying a geographic usage ('1' identifying 'Benadir', for example) or a non-geographic usage ('63' identifying 'Mobile', for example). NDCs can be dialled from inside the country when preceded by the national prefix and from outside the country when preceded by the Country Code (CC) and the international prefix of the originating country.

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<sup>3</sup> The difference between a numbering plan and a Numbering Register is illustrated by the plan for Denmark at [https://ens.dk/sites/ens.dk/files/Tele/nummerplanen\\_2016\\_november.pdf](https://ens.dk/sites/ens.dk/files/Tele/nummerplanen_2016_november.pdf) and the database for Denmark at [https://ens.dk/sites/ens.dk/files/Tele/nummerliste8-cifredeabbonnentnumre\\_november\\_2016.xls](https://ens.dk/sites/ens.dk/files/Tele/nummerliste8-cifredeabbonnentnumre_november_2016.xls).

- A subscriber number is the sequence of digits following a NDC that identifies a specific subscriber or network termination point in that NDC, such as '234567' for a particular office in Benadir.
- A National Significant Number (NSN) comprises an NDC followed by a subscriber number. An International Significant Number (ISN) comprises a Country Code ('252' for Somalia) followed by an NSN. Unless the context requires otherwise, in this paper "number" refers to an NSN with a geographic or non-geographic "usage" (such as 'Benadir' or 'Mobile').
- A prefix is a digit or set of digits dialled before a National Significant Number or an International Significant Number to signal to the network the caller's selection of a certain number format, service or carrier. Normal prefixes are the national prefix '0' and international prefix '00', which are recommended by the ITU and used in Somalia.
- A short code is a short sequence of digits (typically between three and six) that is usually used for a special service. By contrast with NDCs, short codes cannot be dialled successfully from outside the country. They are harmonised between operators to varying degrees; for instance, all operators usually have the same short codes for emergencies, but different operators sometimes have different short codes for their own customer care.
- A vanity number is a number that customers find desirable. The reasons for finding a number desirable can depend on the user (if the number represents an important date, for example) or the country (as in China, where '8' signifies luck and '4' signifies death) as well as on the pattern of digits. Terms such as "golden number", "special number" and "nice number" are used in other documents with the same meaning.
- A seven-digit number is a number having seven digits after spaces are omitted, such as '1 234567' (which in Somalia has NDC '1' and subscriber number '234567'); it can also be said to have "length" seven. Terms such as "eight-digit number", "nine-digit number" and "ten-digit number" are used similarly.
- A block is a set of numbers that have the same first few digits and the same maximum allowed length. Usually, a block comprises all of the numbers having the same first few digits and the same length, so its "size", which is the quantity of numbers that it can contain if all of the numbers have the maximum allowed length, is a power of 10. For instance, a block of numbers that have '1234' as the first four digits and a maximum allowed length of seven digits can contain 1,000 numbers, so it has "size" 1,000; it might be written as '1234xxx'.
- An allocation of numbers is a grant of rights of use of numbers to an operator (who can then provide a telecommunications service), while an assignment of numbers is a grant of rights to a customer (who can then use a telecommunications service); this is not as in ITU-T Recommendation E.101, where "assignment" is used for both these, and "allocation" is used for associating number ranges with areas or services, without granting rights of use. An allocation is usually made by the regulator, but it might be made by an operator (when it is a "secondary allocation"); conversely an assignment is usually made by an operator, but it might be made by the regulator (when it is an "individual assignment"). If one operator provides telephony to a shop or an office of another operator it is assigning numbers, not allocating them.
- A clash occurs when two numbers are treated as being the same as each other even though they are intended to be different. For instance, the seven-digit numbers '1234567' and '1234568' clash with each other in a system that distinguishes between numbers on the basis of their first six digits only (in this case, '123456').

## 2 Detailed recommendations

- Recommendation 1 NCA and the operators should encourage the use of a single written format for national and international numbers in which '0' would be clearly the national prefix and NSNs would appear instead of subscriber numbers on their own. This format might be '(0) NSN' for national numbers and '+252 (0) NSN' for international numbers, or '0 NSN' for national numbers and '+252 NSN' for international numbers. .... 20*
- Recommendation 2 NCA and the operators should discourage the use of local dialling, with the intention of abolishing it when number portability for numbers with the relevant usage is introduced. 20*
- Recommendation 3 NCA should treat numbers in the same NDC as having the same lengths, which need be no greater than at present, given the size of the population and the expected demand for numbers. .... 20*
- Recommendation 4 NCA should create a Numbering Register without delay, including numbers that an operator simply regards as available to it though they have not been allocated formally. The number blocks should be distinguished from each other by their first four digits if necessary, so seven-digit numbers would be specified in blocks of 1,000 numbers and nine-digit numbers would be specified in blocks of 100,000 numbers. .... 22*
- Recommendation 5 Operators should use only the blocks that are already allocated to them, and assign only numbers having the maximum allowed lengths for the blocks. Thus newly assigned numbers would have length seven in fixed NDCs and length nine in mobile NDCs. .... 22*
- Recommendation 6 NCA should require applications for allocations of numbers to justify requests for quantities of numbers that greatly exceed the forecast demands one year ahead and to provide the previous forecast and actual demand. .... 26*
- Recommendation 7 To avoid fragmenting numbering space unnecessarily NCA should choose for allocation the unallocated blocks having the lowest numbers within partially-allocated blocks that are ten times as large, unless the applicants can justify different choices. In particular, blocks of 1,000 numbers should be allocated from within partially-allocated blocks of 10,000 numbers and blocks of 100,000 numbers should be allocated from within partially-allocated blocks of 1,000,000 numbers. 26*
- Recommendation 8 To allow for future expansion NCA should, for each of the one-digit NDCs, set aside a second digit that is not used in currently assigned numbers. Though '0' is already set aside, to avoid clashes between the national prefix and subscriber numbers, using it in a future expansion, to get '10', '20', '30', '40' and '50', would require the abolition of local dialling. .... 26*
- Recommendation 9 To allow for future expansion NCA should set aside four of the two-digits NDCs starting with '6' and '9'. Setting aside '96', '97', '98' and '99' seems appropriate for this purpose because they would let NDCs currently starting with '6', '7', '8' and '9' be replaced by ones collectively having ten times their capacities simply by preceding them by '9'. .... 26*
- Recommendation 10 NCA should protect the first digit '7' for possible ultimate uniform expansion of the Numbering Plan. .... 26*
- Recommendation 11 Customers should be entitled to at least one year of inactivity before their numbers are recycled for assignment to other customers. Recycling should be preceded by clear warnings and at least thirty days during which the numbers can be made active again. "Activity" here includes at least any outgoing or incoming communication and any credit recharge. .... 26*
- Recommendation 12 Operators should recycle numbers if the customers have been inactive for three years. .... 26*

*Recommendation 13 NCA should withdraw blocks of 1,000 seven-digit numbers and blocks of 100,000 nine-digit numbers if no numbers in them have been assigned to customers one year after being allocated. For this purpose numbers recorded when the Numbering Register is created should be deemed to have been allocated at least one year previously. .... 26*

*Recommendation 14 Operators should ensure that police, ambulance and fire emergency services, and child help line services, that are accessible through numbers on their networks are accessible also by '112' and '116' respectively, and that calls to such numbers are free of charge to the callers. .... 28*

*Recommendation 15 Operators should ensure that services for customer care, voicemail deposit, voicemail retrieval, credit recharge and balance check that are accessible through numbers on their networks are accessible also by '100', '121', '123', '130' and '131' respectively. .... 28*

*Recommendation 16 Operators should make the services that are accessible through short numbers also accessible through national significant numbers by national dialling. .... 29*

*Recommendation 17 The dialled digits for one assigned number should not be identical with the start of the dialled digits for a different assigned number in the same NDC. .... 29*

*Recommendation 18 The dialled digits for a short code should not be identical with the start of the dialled digits for an assigned subscriber number in any NDC. .... 29*

*Recommendation 19 Short numbers for voice calls, text messages and USSD should be considered jointly, so that a service available by using more than one of these modes of communication is accessible though a single short number irrespective of which means of communication is used. .... 29*

*Recommendation 20 NCA should protect all NDCs starting with '8' until there is justifiable demand for new numbers that need to be distinctive. .... 29*

*Recommendation 21 NCA should protect NDC '80' for future use in freephone services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers. Calls to such numbers should be free to callers inside Somalia; calls from outside Somalia should be charged on the same basis as other international calls, if the operator and the person assigned the number permit them. .... 30*

*Recommendation 22 NCA should protect NDC '81' for future use in economy rate services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers. Calls to such numbers should be charged on a basis no less favourable to customers than that for fixed and mobile calls made from the same point. .... 30*

*Recommendation 23 To simplify the protection requirements while still permitting content services NCA should require that any content service, whether to a short number or to a premium rate number, be charged on a basis amounting to no more than twice the rate applicable to a conventional person-to-person call made from the same national or international end point. .... 31*

*Recommendation 24 NCA should protect NDC '89' for future use in premium rate services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers. 31*

*Recommendation 25 NCA should protect a currently vacant two-digit NDC that is not especially attractive to humans, such as '86', for future use in machine-related services. If demand for these services emerges to an extent that the existing fixed numbers or mobile numbers risk exhaustion NCA should allocate the numbers in blocks of 1,000,000 twelve-digit numbers. .... 32*

*Recommendation 26 NCA should deal with complete applications for allocations of numbers within thirty days, other than in exceptional circumstances. .... 33*

<i>Recommendation 27 NCA should withdraw allocated numbers only if they are not used, they are used in ways contrary to the Numbering Regulation, or they are needed for other purposes because of a number change (which itself should be the subject of a public consultation).</i> .....	33
<i>Recommendation 28 Operators that allocate numbers to others should remain responsible for compliance with the Numbering Regulation for the allocated numbers.</i> .....	34
<i>Recommendation 29 NCA should publish the Numbering Register, showing which blocks are allocated and to whom these blocks are allocated. Publication should be by upload to a website, with copies distributed to all of the operators.</i> .....	34
<i>Recommendation 30 Operators should provide numbering records to NCA annually. These should indicate how many numbers are assigned, and how many numbers are assignable, for each NDC. ..</i>	34
<i>Recommendation 31 NCA should audit the Numbering Register annually.</i> .....	34
<i>Recommendation 32 NCA should publish the Numbering Plan, showing at least the usages of blocks that are allocated or free for allocation. Publication should be by upload to a website, with copies distributed to all of the operators.</i> .....	34
<i>Recommendation 33 NCA should review the Numbering Plan annually.</i> .....	34
<i>Recommendation 34 NCA should retain reserve powers to charge for numbers, at levels expected to avoid inefficient use. The charges for a number block should then be calculated as if all of the numbers in the block have the maximum allowed length appropriate to the usage of the block, regardless of their actual lengths.</i> .....	36
<i>Recommendation 35 NCA should regulate the charges by operators for numbers only in the same circumstances as it regulates the charges by operators for services, which are typically when an operator has significant market power.</i> .....	37
<i>Recommendation 36 NCA and the operators should bring the rights of use of numbers to the attention of customers.</i> .....	37
<i>Recommendation 37 Numbers should be changed only if the costs of doing so are justified by the benefits.</i> .....	39
<i>Recommendation 38 If numbers are to be changed, NCA and the operators should observe, and agree on details of, guidelines like those provided here.</i> .....	39
<i>Recommendation 39 When competing mobile networks are interconnected, NCA should review periodically whether the networks serve enough customers with low incomes and outside cities for operator mobile number portability to be introduced.</i> .....	42
<i>Recommendation 40 NCA should ensure that wholesale termination charges are low enough not to discourage customers from making off-net calls, regardless of when operator number portability is introduced.</i> .....	42
<i>Recommendation 41 NCA and the operators should consider, as an interim alternative to operator number portability, setting aside some number blocks for matched assignment by all of the operators, so that a customer assigned a number in such a block by one of the operators is entitled to be assigned the matching numbers by all of the operators.</i> .....	42
<i>Recommendation 42 NCA and the operators should ensure that, in any collectively adopted ENUM system, user information is up-to-date and not accessible from the public internet, all operators can be offered non-discriminatory pricing for the use of the system, and the system supplier is selected openly and reviewed periodically.</i> .....	43

*Recommendation 43 NCA and the operators should ensure that the applications for allocations of internal network codes are considered efficiently. A possible test of this is whether they are granted or refused within one day of submission. .... 45*

*Recommendation 44 NCA and the operators should ensure that the Numbering Register is maintained for internal network codes..... 45*

*Recommendation 45 NCA should notify ITU about any changes to the allocations of International Signalling Point Codes and Mobile Network Codes. .... 45*

*Recommendation 46 NCA and the operators should consider whether any national standards for internal network codes are needed. .... 45*

## 3 Global developments in numbering

### 3.1 Reducing the meaning of numbers

Telephony numbering supports service provision in two main ways, through:

- The meaning embedded in the initial digits of numbers. For instance, in Somalia the first digit '1' means "Benadir" and the first and second digit pair '63' means "mobile".
- The quantity of numbers with a given meaning, which depends on the length of the numbers. For instance, in Somalia numbers starting with '1' have six further digits, yielding one million numbers, while numbers starting with '63' have seven further digits, yielding ten million numbers. The public (and, often, operators) are helped by knowing how many digits to expect for a recognised usage, such as mobile.

There can be trade-offs: having more divisions of the numbering space lets meaning be embedded more deeply in numbers but leads to less efficient use of the space.

The meaning in numbers is reduced when there is number portability. For instance, with the most common type of portability for mobile numbers, a number that was originally associated with one operator may belong to a different operator, so that element of meaning in the number is no longer reliable. Likewise, portability of geographic numbers between one geographic area and another reduces the geographic meaning coded into numbers. If (as has happened in a few countries) there is full portability between fixed and mobile, the meanings of "fixed" and "mobile" become similar. When call charges to fixed and mobile phones are similar, and uninteresting to most users (because they are very low compared with disposable incomes), these distinctions might be deliberately abandoned to allow more efficient use of the numbering space<sup>4</sup>.

### 3.2 Making space for more numbers

Historically, in most countries the numbering plans were designed around the geography of the fixed network, with first digits used to indicate regions and often second digits used to indicate sub-regions. When mobile services arrived, mobile numbers were formed with National Destination Codes (NDCs) using any first digit that happened to be spare: often this was '9' or another late digit.

Demand for mobile numbers now greatly outweighs demand for fixed numbers in most countries, and in response numbering plan reviews have shown two main trends, towards:

- Longer mobile numbers, following the initial digits already in use. Adding a digit multiplies the space available by 10. Additional digits impose some burden on users and operators, but with modern equipment this has become a minor factor.
- Greater availability of NDCs for mobile and other new services. If geographic numbers take up too much of the plan, they may be restructured to take up less; for instance, when too many first digits have geographic significance, a single extra digit might be prefixed to all geographic numbers.

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<sup>4</sup> This loss of meaning has gone furthest in Denmark, which manages well within the constraints of a uniform eight-digit numbering plan.

### 3.3 Abolishing local dialling

Within a particular region of the fixed network customers can often make calls without dialling the digits that signify the region. Historically, this let local calls have lower charges. Similar 'local dialling' is sometimes available also in mobile networks: where an operator needs only one NDC its customers might be able to make calls to each other without dialling the NDC. However, such local dialling has little value when a fixed network has one-digit NDCs, when a mobile operators needs more than one NDC, or when there is number portability; then 'national dialling', of full NSNs (with the national prefix, if there is one), can be used instead.

Plans for smaller countries, such as Singapore, typically do not provide local dialling: they may have little geographic structure, and relatively short NDCs, so that dialling full national numbers is not burdensome. Around the world there is a gradual movement towards abolishing local dialling, as<sup>5</sup>:

- Calls from mobile phones increasingly predominate and usually require national dialling anyway; also, modern phones store numbers so the lengths of dialled numbers matter less.
- Lower transmission costs tend to simplify the geography embedded in numbering plans and reduce, or even remove, the difference between charges for local calls and charges for long distance calls, so different dialling procedures are no longer needed.
- Abolishing local dialling is an easy way to expand the geographic numbering space by 25%, as the digits '0' and '1' following the NDC can be used, as well as the previous '2' to '9'. Subscriber numbers starting with '0' or '1' can be made available to new operators in all geographic areas, thereby providing them with the same ranges of numbers everywhere<sup>6</sup>.

### 3.4 Introducing new services

Over the years several new services have been identified in standards for international numbers and copied in standards for national numbers, but very few have attracted much use anywhere, and, where they have been used, the uses have sometimes been quite undesirable<sup>7</sup>. Also, specifying new service numbering that is unnecessary is counter to the trend towards more flexible use of numbering. Still, there remain occasions when numbering is required for new services, or at least desired. The requirements may include:

- Ease of recognition by the public. Freephone is a good example, with the NDC '800' by now well known around the world as meaning that a call to the number is free of charge<sup>8</sup>. A variant of '800', such as '810', might indicate that the call is charged at a modest rate only.

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<sup>5</sup> Abolishing local dialling is said to be "closing" the numbering plan. However, "closing" the plan might sometimes refer instead to making numbers have the same length, because abolishing local dialling usually makes the lengths of dialled numbers more uniform.

<sup>6</sup> This assumes that '0' is the national prefix and that '1' is kept for short numbers (which is not so in Somalia).

<sup>7</sup> For instance, in 2011 the regulator in Australia decided to abolish numbering for Universal Personal Telecommunications (UPT) because it was unused, as discussed at [http://www.acma.gov.au/~media/Numbering\\_and\\_Projects/Information/pdf/Telephone\\_Numbering\\_Future\\_Directions.PDF](http://www.acma.gov.au/~media/Numbering_and_Projects/Information/pdf/Telephone_Numbering_Future_Directions.PDF). By contrast, in the UK, it has been used, but largely for unauthorised premium rate services; the regulator has struggled to curb such uses but has stopped short of abolishing the numbering because of residual valid uses (for temporary connections for hospital patients, for example). Of course, mobile phones make it largely unnecessary.

<sup>8</sup> If there is a national prefix it usually precedes '800', giving '0800' in most of the world but '1800' in the North American Numbering Plan (NANP).

- Ease of identification for regulatory monitoring or call barring. Thus in many countries outgoing calls to premium rate services that are dialled with variants of the NDC '900' can be barred, while in India incoming calls from marketing call centres that use '140' can be barred.
- Ease of remembering. Particularly where numbers are advertised briefly (on television, for example) a short string or an obvious pattern may be wanted.
- Lack of association with existing services. For instance, some Voice Over Internet Protocol (VOIP) providers position their offerings as alternatives to fixed or mobile services, and therefore want ordinary fixed or mobile numbers, while others stress the difference from fixed and mobile services, and therefore want numbering that clearly does not belong to a fixed or mobile network.
- Potentially large demand for numbers. For instance, some Internet Of Things (IOT) services use Subscriber Identity Modules (SIMs) that could be built into cars, household appliances, environment sensors and much more.
- International accessibility. Some new services need to be accessible from outside the country; this is often so for VOIP and IOT services.
- International harmonisation. Where services are internationally accessible or will be used by many travellers, there may be value in using codes that are familiar elsewhere.
- Convenience of routing. Traffic can be heavily concentrated in bursts for numbers such as help lines during disasters or phone-in numbers advertised on television. Even without this, an operator might simply prefer that just the first few digits be analysed for routing, though switch functions in national networks now often permit very deep digit analysis.

The options for new service numbering are:

- Where recognition by the public matters, distinctive NDCs are typically chosen. A vacant first digit of the numbering plan, such as '1' or '9', might be used; if there is no vacant first digit, a vacant second digit, typically '0' (as in Japan and Taiwan, for example), might be used. "Hundred" numbers such as '400' (for local rate numbering in China) are also used widely for distinctive numbering.
- Where recognition by the public does not matter, any available national numbers can be pressed into service. Though existing geographic NDCs are typically avoided to simplify routing, even they can be used if they have spare space (with number recognition and routing on the first digit following the NDC).
- Where there are geographic NDCs, local services might be accessed in the corresponding geographic areas by dialling numbers (without NDCs) having lengths that are different from those of ordinary subscriber numbers. Examples of this are '96' (with three further digits) in China and '555' (with four further digits) in the US.
- Where ease of remembering is important and the quantity of numbers needed is not great, short numbers might be used. They have become especially popular for special services from mobile phones. However, they are usually specific to particular networks and not accessible internationally. They can also complicate matters and confuse customers, if (as in Bahrain) voice calls to short numbers go off-net but text messages to short numbers stay on-net.

### 3.5 Catering for an unpredictable future

Numbering plan design has always aimed to cater for the long term (measured in decades). Despite such good intentions, it has often fallen short: in particular, the enormous growth in cellular mobile took many by surprise and has required expedient measures in some countries to ensure the availability of enough numbers. On the other hand, the shift to Internet Protocol (IP) has led to talk of ITU-T Recommendation E.164 numbering becoming obsolete, though it seems to have plenty of life left in it.

In the face of such uncertainties, the best practice in devising numbering plans is to allow flexibility, while not making changes before they are clearly needed. This usually involves:

- Reserving a first digit that can be used as a prefix to expand the entire numbering plan (though actual expansion of this kind now seems to be used less than formerly).
- Having free NDCs that can be given any desired meaning. Preferably, they would not be “tainted by association” with meanings which are already widely understood, as ‘6’ is for mobile in Somalia.
- Being able to expand the supply of any given kind of number within its existing meaning. Typically this is done by reserving one digit following the meaningful initial digits.

## 4 Number structure

### 4.1 Possible numbering principles

Numbering in Somalia was studied for the ITU in about 2003 (though it has not been found in the files)<sup>9</sup>. The examination of telephone numbers for this paper appears to confirm that there is, or was, a plan. Here the outline of a plan is sketched in the following possible numbering principles:

- National dialling in Somalia involves dialling in sequence the national prefix ('0') and an NSN, which comprises an NDC and a subscriber number. At the start of the sequence '0' is the national prefix, which becomes the international prefix ('00') if followed immediately by '0'.
- A fixed network NSN has seven digits, starting with the NDC (which is '1', '2', '3', '4' or '5'). A mobile network NSN has nine digits, starting with the NDC (which has two digits and starts with '6' or '9'). A subscriber number or a short code could start with any of the digits from '1' to '9' without clashing with an NSN, because of the use of the national prefix in dialling.
- Within the fixed networks, there is local dialling in which just the subscriber number is dialled, without the national prefix and the NDC. An operator might apply local call charges when calls are dialled locally and long distance charges when calls are dialled nationally, even though the calls might be between nearby locations.
- Within some, but not all, of the mobile networks, there is local dialling in which just the subscriber number is dialled if the calling party and the called party have the same NDC.

Figure 1 demonstrates that these possible numbering principles are similar to those in twelve benchmark countries in Africa, after allowing for the systematic use of '000' as the international prefix by states in East Africa<sup>10</sup>.

---

<sup>9</sup> Earlier, in about 1996, there were five-digit numbers, with no national prefix, for Mogadishu, Hargeisa (with code 21) and Bosaso (with code 52).

<sup>10</sup> The subscription figures, for 2016, come from <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>.

**Figure 1 Some numbering plan features**

Country	Inhabitants (thousands)	Subscriptions per thousand inhabitants		Lengths of National Significant Numbers	First digits of National Destination Codes			Prefixes		First digits of Short Codes
		Fixed	Mobile		Fixed	Mobile	Special	Nat-ional	Inter-national	
Burundi	9,824	2	480	8 2	6, 7			00	1, 7	
Djibouti	961	27	378	8 2	7			00	1, 7	
Egypt	89,125	71	1,136	8, 9, 11	2-9	1	7-9	0	00	1
Eritrea	6,895	10	73	7 1, 8	7			0	00	
Ethiopia	99,391	11	505	9 1-5	9	9		0	00	9
Kenya	45,533	2	813	6, 7, 8, 9	2, 4-6	1, 7	8, 9	0	000	1-9
Nigeria	181,563	1	818	7, 8, 10	1-9	7-9		0	009	
Rwanda	11,324	1	699	8, 9 2	7	0, 8, 9			000	1, 4
South Africa	54,957	66	1,424	10, 14	1-5	6-8	8, 9	0	00	1, 3, 4
Tanzania	51,046	2	744	9, 10 2	6, 7	4, 8, 9			000	0, 1
Tunisia	11,118	86	1,258	8 3, 7	2, 4, 5, 7, 9	8			00	0, 1, 8
Uganda	37,102	9	551	6, 7, 8, 9	2-4	7	8, 9	0	000	1, 2, 6-9
Somalia	12,318	30	600	7, 9 1-5	6, 7, 9			0	00	1-3, 7-9

## 4.2 Existing number presentations

The current numbering practices might be rather different from the possible numbering principles. There are many examples where numbers are written in ways that break the principles. In brief:

- ‘0’ is not used consistently as the national prefix; sometimes it is:
  - Included in the NDC (as in Figure 2).
  - Omitted from the dialling sequence (as in Figure 3).
- ‘1’, ‘2’, ‘3’, ‘4’ and ‘5’ are not used consistently as the NDCs for fixed numbers; sometimes they are:
  - Omitted after ‘+252’ (as in Figure 4).
  - Treated as the national prefix (as in Figure 5)
  - Used as the NDC for a mobile number (as in Figure 7).
- Numbers can be longer or shorter than expected (as in Figure 6 and Figure 7).

Most of these examples are not from small organisations but from large organisations that might expect to have much international traffic. Some of them are even from telecommunications companies. Many of them might not lead to successful dialling, but some might do so. All are potentially confusing, because of their diversity of number formats. Restoring simple numbering principles would let more calls be dialled successfully.

**Figure 2 Incorrect inclusion of the national prefix in a mobile network NDC & Incorrect inclusion of the national prefix in a fixed network NDC**

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616666660 / 0699961066 / 0699962508  
E-mail: info@jubbaairways.com  
jubbaairways.com

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**252-05-822220**

**Figure 3 Incorrect omission of the national prefix before a mobile network NDC & Local omission of the national prefix and a fixed network NDC**

**GAABOW GENERAL SERVICE**  
See the Difference

Contacts:  
850024 | 625031 |  
615502004 | 616303030 |  
615012004 | 615900650

Address:  
Makka Al-mukarama  
District, Mogadishu-Somalia

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شريك في النجاح

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**Figure 4 Incorrect omission of a mobile network NDC & Incorrect omission of a fixed network NDC**

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TRAVEL EXPRESS CARGO  
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Hargeisa

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9.5614874

Address:  
Hargeisa Central  
Rusheeye building -A,  
Hargeisa, Somalia

Country:  
Somalia

Facebook:  
Travel Express Limited

Longitude:  
44.0614641

Rating:  
★★★★★

**QAASIM ELECTRONICS**  
Ground Floor, Amaana Building, Howl-Wadaag, Bakara Market  
+252651050 +252615522020  
alikasim1@gmail.com

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**Figure 5 Incorrect use as the national prefix of a fixed network NDC & Inconsistent use of the national prefix with a fixed network NDC**

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**beco**  
Powering Somalia.

<b>OCPV Headquarter</b> University of Hargeisa Pepsi area, Hargeisa Somaliland Telephone: +2522 515579 Mobile: +252(0) 63 4405564, 634425779	<b>OCPV Mogadishu Office</b> Zone KM 5, opposite Samira Hotel Hodan District Telephone: + 252 (0) 1850221
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For more information send your queries to this email: [info@ocvp.org](mailto:info@ocvp.org)

**Figure 6 A ten-digit number with a fixed network NDC & A five-digit number with a fixed network NDC**

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Reaching The Unreached

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**Line Information**  
Int'l : (252) 828 3210 / 3924  
Local : 53210 / 53924

**GSM Information**  
Int'l : (252) 828 5422  
Local : 55422

**SOTELO**  
The Pioneer of Telecommunication in Somaliland

**Figure 7 Unconventional use in a mobile number of a fixed network NDC & An eight-digit number with a fixed network NDC**

**YH** **YAHYE HOTEL**  
Mohamed Yussuf Mohamed  
Receptionist

Mob: +252 2 4162759  
Tel: +252 2 740577  
Berbera - Somaliland

**MH** **MAAN-SOOR HOTEL**  
BERBERA, SOMALILAND

Tel: 00 252-2-4419423/4244240 (Telesom)  
 Tel: 00 252-2-7-9770030 (Somtel)  
 Email: [maansoorhotelberbera@hotmail.com](mailto:maansoorhotelberbera@hotmail.com)  
 Website: [www.maan-soor.com](http://www.maan-soor.com)

### 4.3 Repairing the structure of numbers

The way in which numbers are written affects their ease of use. Having standard number layouts helps, as does breaking long numbers into shorter pieces (“chunking”); for example, people reading an advertisement are likely to recall ‘(0) 97 573 4821’ better than ‘0975734821’.

**Recommendation 1** *NCA and the operators should encourage the use of a single written format for national and international numbers in which ‘0’ would be clearly the national prefix and NSNs would appear instead of subscriber numbers on their own. This format might be ‘(0) NSN’ for national numbers and ‘+252 (0) NSN’ for international numbers, or ‘0 NSN’ for national numbers and ‘+252 NSN’ for international numbers.*

In some countries, there are other prefixes besides the national and international prefixes. In particular, carrier selection codes are prefixes that extend the national and international prefixes, to ensure the use of particular national and international networks for carrying traffic. They do not appear to be needed now in Somalia, as there are several other ways of achieving the same reductions in call costs, such as secondary dialling, switching to second SIMs and using Over-The-Top (OTT) services<sup>11</sup>. Thus the national and international prefixes can stay the only prefixes in Somalia.

In Somalia local dialling has an occasional advantage: it can shorten dialling sequences from eight digits to six for fixed calls and from ten digits to seven for mobile calls, but only when the calling party and the called party have the same NDC (so in reality the call must use only the fixed network in a single geographic area). Its disadvantages are that it adds to the muddle (typified by Figure 3, Figure 4 and Figure 5) over which dialling sequences can succeed in setting up calls, and it discourages users from changing between networks.

**Recommendation 2** *NCA and the operators should discourage the use of local dialling, with the intention of abolishing it when number portability for numbers with the relevant usage is introduced.*

If there is no local dialling then there is no need for a national prefix and ‘0’ could become available as the first digit of NDCs. This usage would be consistent with some ways in which numbers have been written in Somalia (exemplified in Figure 2 and Figure 3). However, the continued use of ‘0’ as the national prefix seems to fit better with current usage overall.

Having different lengths for numbers leads to incorrect dialling (as users become confused about how many digits there should be) and waste (as, for example, a five-digit number occupies 100 times the space of a seven-digit number). If there are too few numbers available it is also unfair on new operators, who are unable to obtain numbers as short as those of existing operators. However, some differences in length seem inevitable, if numbers currently in use are not to be changed. The best that can be done is to ensure that numbers of the same length are used when the service is the same.

**Recommendation 3** *NCA should treat numbers in the same NDC as having the same lengths, which need be no greater than at present, given the size of the population and the expected demand for numbers.*

---

<sup>11</sup> For the same reasons, special arrangements for cross-border dialling near national or international borders are not needed. An early motivation for them was the wish to have routes between nearby places that were shorter than those going through capital cities, but falls in transmission costs and improvements in switch functions have made this motivation unimportant.

## 5 Number claims

### 5.1 Existing number announcements

In Somalia there has been no formal system for allocating numbers and no authoritative table of which numbers have been allocated. The information in this paper has needed to come from the ITU *Operational Bulletin*, the price tables of international call resellers and the answers from the operators to our questions. These are inconsistent, incomplete and out of date. To illustrate this, Figure 8 displays what should be the most authoritative of these: the notifications to the ITU for the ITU *Operational Bulletin* that collectively provide the numbering plan as seen by the ITU<sup>12</sup>. It includes three operators that do not seem to be active and it excludes three big ones that are active. Despite the exclusions it provides 630,000 fixed numbers and 111,000,000 mobile numbers for 12,318,000 people; it also specifies two different length for both the fixed numbers and the mobile numbers.

**Figure 8 Existing published announcements to the ITU**

Operator	Date	Lengths of National Significant Numbers		First (or first and second) digits of National Significant Numbers	
		Fixed	Mobile	Fixed	Mobile
Somali Network Telecom	21/10/2016	6	8	85	64, 80, 88
Somtel	21/10/2016	6	9	1, 3, 4	79, 62, 65, 66
AirSom	21/10/2016	6	9	81, 82	35, 39, 48, 49
Somali Telecom Group	18/08/2015		8		92, 93, 94, 95, 96, 97, 98, 99
Golis	14/04/2009	7	9	55, 57, 58	90, 91

### 5.2 Documenting the claims for numbers

There is an urgent need for an authoritative Numbering Register which would:

- Eliminate negotiations about numbering between operators.
- Avoid clashes between new uses and overlooked existing uses.
- Make space available for new operators and new uses.
- Allow the planning of future developments.

<sup>12</sup> The notifications are at [https://www.itu.int/dms\\_pub/itu-t/oth/02/02/T02020000C00004PDFE.pdf](https://www.itu.int/dms_pub/itu-t/oth/02/02/T02020000C00004PDFE.pdf). Those provided here exclude two that appear to have been contradicted by more recent ones.

Though this paper documents some claims for numbers it is not detailed enough to provide everything that is needed. An immediate task for NCA is to obtain the details.

**Recommendation 4** *NCA should create a Numbering Register without delay, including numbers that an operator simply regards as available to it though they have not been allocated formally. The number blocks should be distinguished from each other by their first four digits if necessary, so seven-digit numbers would be specified in blocks of 1,000 numbers and nine-digit numbers would be specified in blocks of 100,000 numbers.*

**Recommendation 5** *Operators should use only the blocks that are already allocated to them, and assign only numbers having the maximum allowed lengths for the blocks. Thus newly assigned numbers would have length seven in fixed NDCs and length nine in mobile NDCs.*

## 6 Number availability

### 6.1 Population

Figure 9 tabulates the populations of the different states of Somalia<sup>13</sup>. Considerations of location and population suggest that, for numbering purposes, Galmadug and Hirshabelle should be grouped together and South West and Jubaland should be grouped together. The latter group is the most populous, with 3,723,000 inhabitants and 642,000 households.

**Figure 9 Populations of states in Somalia**

State	Inhabitants (thousands)					Households (thousands)				
	Urban	Rural	Nomadic	Internally Displaced	All	Urban	Rural	Nomadic	Internally Displaced	All
Somaliland	1,574	340	644	78	2,637	239	55	97	21	411
Puntland	891	141	887	64	1,984	143	22	129	29	324
Galmudug	565	132	400	191	1,287	92	20	57	47	216
Hirshabelle	196	385	353	103	1,037	27	77	56	20	180
Benadir	1,281	0	0	369	1,650	187	0	0	116	303
South West	371	1,321	503	167	2,362	60	207	78	15	361
Jubaland	338	488	400	134	1,361	62	99	71	50	281

### 6.2 Fixed numbers

In NDCs '1', '2', '3', '4' and '5' together in principle there can be 5,000,000 seven-digit NSNs, amounting to 0.40 NSN per inhabitant or 2.4 per household. However, these numbers must be split between the seven states; if Galmadug and Hirshabelle are grouped together and South West and Jubaland are grouped together, the five sets of 1,000,000 seven-digit NSNs that in the most populous group provide 0.26 NSNs per inhabitant or 1.5 NSNs per household<sup>14</sup>.

Among the benchmark countries of Figure 1, the highest fixed network penetration in 2016 was achieved by Tunisia, with 0.086 subscriptions per inhabitant; the figure for Somalia was 0.003, while that for developed countries together was 0.38<sup>15</sup>. There therefore seem to be plenty of NSNs available for fixed numbers in Somalia.

However, some caution is needed, for the following reasons:

- Network structure and operational convenience might limit the freedom with which numbers can be associated with destinations; for instance, a multiplexor capable of providing 120 lines might have very few lines connected but need 120 numbers nonetheless.

<sup>13</sup> The estimates are from UNFPA, 2014, and UNHCR, 2014; some from other sources are higher, especially for Somaliland, Puntland and South West.

<sup>14</sup> Even though the NDCs cover large geographic areas there could be overflow into adjacent areas.

<sup>15</sup> The figures are generally declining: Egypt had 0.16 subscriptions per inhabitant in 2008 (but now has 0.071) and Somalia had 0.012 subscriptions per inhabitant in 2003 (but now has 0.003).

- To permit simple direct inward dialling, a large customer might be assigned a number block containing many more numbers than it needed; for instance, it might be assigned 1,000 numbers though it had only 240 employees.
- The five NDCs '1', '2', '3', '4' and '5' are not used just for fixed numbers having seven digits: they are also used for numbers having fewer than seven digits (such as short numbers having three digits).

A three-digit short number occupies the space that could otherwise be occupied by 10,000 seven-digit fixed numbers; 50 such numbers would occupy 10% of the space that could otherwise be provided by the five one-digit NDCs. On the other hand, a nine-digit mobile number occupies the space that could otherwise be occupied by one seven-digit fixed number; 5,000,000 such numbers would occupy only 1% of the space that could otherwise be provided by the five one-digit NDCs. Short numbers therefore have a more severe effect if they displace fixed numbers than they do if they displace mobile numbers.

A fixed number is usually associated with a geographic area that can be identified by the usage of its NDC. Though in Somalia the geographic areas can conveniently be chosen to be the states (grouped together in some cases), the networks are not confined to these geographic areas. In the Numbering Plan a geographic usage therefore describes where the destinations of calls are likely to be, not where the destinations of calls must be.

In fact the destination of a call may be inside or outside the geographic area indicated by the NDC. As an extreme example, for one operator numbers starting with '13', which might be expected to identify destinations in Benadir, actually identify destinations in Galmadug that, by contrast with destinations in Puntland, have local dialling and local call charges from Benadir; this is so even for destinations in Galkayco, which is split between Galmadug and Puntland. Anomalies at boundaries such as this suggest that geographic significance should be removed from fixed numbers.

### 6.3 Mobile numbers

Among the benchmark countries of Figure 1, the highest mobile network penetration in 2016 was achieved by South Africa, with 1.4 subscriptions per inhabitant; the figure for Somalia was 0.6, while that for developed countries together was 1.3<sup>16</sup>. A two-digit NDC (such as '63') can provide 10,000,000 nine-digit NSNs or 0.8 subscriptions per inhabitant. By this argument, the two-digit NDCs starting with '6' and '9' should be more than enough for Somalia.

Again, some caution is appropriate, for the following reasons:

- For administrative convenience some operators assign mobile numbers from different NDCs in different parts of Somalia, though the service is the same everywhere. They might therefore want more numbers than would be needed just to provide a number to everyone.
- Numbers are entered into SIMs that are then distributed and sold. There could be many numbers entered into SIMs in distribution chains. Such numbers are assignable to customers, though they might not have reached points of sale.

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<sup>16</sup> These figures, from the ITU compilation at <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>, are questionable. The 2017 report for the World Bank, *Mobile Money Ecosystem in Somalia* (summarised at [http://www.alticonsulting.com/wp-content/uploads/2017/11/WB-MME\\_Final-Short-Version\\_20170608.pdf](http://www.alticonsulting.com/wp-content/uploads/2017/11/WB-MME_Final-Short-Version_20170608.pdf)), on the basis of a survey of 1,796 people estimates that in Somalia there are 1.4 Subscriber Identity Modules (SIMs) per inhabitant (though after correction for this paper the figure reduces to 1.2). Even this figure might need to be doubled, especially in the absence of number portability.

- When customers become inactive their numbers might or might not be recycled for assignment to other customers. If there is recycling it should be preceded by a period when the number is not assignable again, so that later customers do not receive calls intended for earlier customers<sup>17</sup>. If there is no recycling (as is currently so for some operators) then numbers disappear from the supply of usable numbers: they are both inactive and not assignable to customers, because they are already assigned.
- Numbers might be not assignable to customers for various other reasons; for instance, they might be set aside because they are needed for network tests or are likely to be dialled incorrectly. However, numbers that are set aside because they are to be assigned to a particular customer or are to be included in packages with vanity numbers are assignable to customers.

If there is no recycling of numbers assigned to inactive customers then eventually the supply of numbers will be exhausted. Accordingly operators will introduce periods after which such numbers are recycled, and the regulator will need to make sure that these periods are appropriate to safeguarding the customer and conserving the supply of numbers. This suggests that there should be a minimum period during which inactive customers will keep their numbers, and a maximum period during which operators may keep such numbers before recycling them<sup>18</sup>. The best lengths for these periods could be debated<sup>19</sup>.

To discourage waste, regulators often require that before a new allocation of numbers is made the existing allocations should collectively have a high enough proportion of numbers that are not assignable to customers<sup>20</sup>. The required “high enough proportion” needs to be fairly low if an operator is growing fast (because it needs many SIMs in its distribution chains before it acquires customers), so it might need to be raised occasionally as the market develops<sup>21</sup>. An alternative requirement, adopted in the management of the North American Numbering Plan (NANP) and preferred here, is that a new allocation should be justified by the time that will pass before the existing allocations are exhausted.

#### **6.4 Ensuring the availability of numbers**

There should be no shortage of numbers in Somalia. However, allocations have been reported to the ITU that are well in excess of the needs of the country at present. If these allocations remain there will be a shortage of numbers, so they need to be removed.

In addition, careful management is needed to avoid problems arising and to provide flexibility long term. For instance, Over-The-Top (OTT) operators, which use the internet infrastructure but not conventional switching, might be allocated their own numbers by NCA, instead of receiving

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<sup>17</sup> This period is sometimes said to be for “quarantine”, “sterilisation” or “cooling”.

<sup>18</sup> The former period is not necessarily the same as the period of inactivity that is standardised for counting subscribers: ITU requires that an ‘active’ subscriber have used the system within the previous three months..

<sup>19</sup> A press notice concluding extensive deliberations about inactivity in India was issued in 2013 at <http://traai.gov.in/WriteReadData/WhatsNew/Documents/12-2013-Information Note to the Press.pdf>.

<sup>20</sup> This proportion is called the “utilisation”. However, sometimes the utilisation is taken to be the proportion of numbers that are used, without any clarity about what “used” means.

<sup>21</sup> The required “high enough proportion” is the utilisation threshold. In many countries it is somewhere between 50% and 80%, tending towards the high end and rising over time.

allocations from others. Much of the management therefore relates to conserving numbers and keeping space for new entrants.

**Recommendation 6** *NCA should require applications for allocations of numbers to justify requests for quantities of numbers that greatly exceed the forecast demands one year ahead and to provide the previous forecast and actual demand.*

**Recommendation 7** *To avoid fragmenting numbering space unnecessarily NCA should choose for allocation the unallocated blocks having the lowest numbers within partially-allocated blocks that are ten times as large, unless the applicants can justify different choices. In particular, blocks of 1,000 numbers should be allocated from within partially-allocated blocks of 10,000 numbers and blocks of 100,000 numbers should be allocated from within partially-allocated blocks of 1,000,000 numbers.*

Expansion in the long term should remain possible.

**Recommendation 8** *To allow for future expansion NCA should, for each of the one-digit NDCs, set aside a second digit that is not used in currently assigned numbers. Though '0' is already set aside, to avoid clashes between the national prefix and subscriber numbers, using it in a future expansion, to get '10', '20', '30', '40' and '50', would require the abolition of local dialling.*

**Recommendation 9** *To allow for future expansion NCA should set aside four of the two-digits NDCs starting with '6' and '9'. Setting aside '96', '97', '98' and '99' seems appropriate for this purpose because they would let NDCs currently starting with '6', '7', '8' and '9' be replaced by ones collectively having ten times their capacities simply by preceding them by '9'.*

Operators are claiming NDCs starting with '7' for both fixed numbers and mobile numbers, but probably few such fixed numbers are used and no such mobile numbers are used. If at all possible the NDCs should be set aside.

**Recommendation 10** *NCA should protect the first digit '7' for possible ultimate uniform expansion of the Numbering Plan.*

Customer interests must be looked after, even while the supply of numbers is depleted.

**Recommendation 11** *Customers should be entitled to at least one year of inactivity before their numbers are recycled for assignment to other customers. Recycling should be preceded by clear warnings and at least thirty days during which the numbers can be made active again. "Activity" here includes at least any outgoing or incoming communication and any credit recharge.*

However, numbers should not disappear from the supply forever.

**Recommendation 12** *Operators should recycle numbers if the customers have been inactive for three years.*

**Recommendation 13** *NCA should withdraw blocks of 1,000 seven-digit numbers and blocks of 100,000 nine-digit numbers if no numbers in them have been assigned to customers one year after being allocated. For this purpose numbers recorded when the Numbering Register is created should be deemed to have been allocated at least one year previously.*

## 7 Number use for providing content

### 7.1 Short codes

The operators in Somalia currently use almost any digit from '1' to '9' start a short number; '1' predominates, but at least '3', '7' and '8' are used also. Different operators have different short numbers from each other, even for special services such as customer care and mobile money.

There could be significant public and commercial benefits from harmonising short numbers among the operators, so that different operators would offer the same special services through the same number; then customers who use more than one network, or who switch networks, would be less likely to make mistakes and more likely to make full use of the facilities. The benefits, and the regulatory treatment in many countries, depends on the services accessed through the short numbers, typically as follows<sup>22</sup>:

- Certain services must be provided, and the operators must use particular numbers specified by the regulator. Of these the most widespread is '112', but there are others, such as '911' in the NANP and '999' in East Africa. At least emergency services must have the same numbers on all networks, as someone in a panic is unlikely to pay much attention to the choice of network.
- Some services do not need to be provided, but if they are provided the operators must use particular numbers specified by the regulator. For instance, in the European Union (EU) "social value" services are accessible through short codes that start with '116'; most member states have implemented such numbers for child help lines, often along with previously established numbers<sup>23</sup>. Similarly in the EU directory enquiry services are accessible through short codes that start with '118'<sup>24</sup>.
- Other services do not need to be provided, and operators do not need to use particular numbers specified by the regulator<sup>25</sup>.

The National Communications Act, 2017, lists various services that would normally fall in the first two of these groups and urges NCA to encourage the development of the emergency infrastructure (including the associated numbers). Elsewhere many of these services would use short numbers starting with '1' (or sometimes, if there is no local dialling, '0'). However, currently:

- There are three emergency numbers in Mogadishu (which are '999' for ambulance, '888', for police and '555' for fire); none except perhaps '888' is operating, but '888' is also the customer care number of one operator.
- The police emergency numbers in Hargeisa (which are, or were, '520172' and '520257' from Telesom and '7923169' and '7923170' from Somtel) are not short or otherwise memorable.

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<sup>22</sup> There are various loose classifications of short numbers. Many of them result in three classes ('A', 'B' and 'C') that roughly fit the three paragraphs about short numbers here.

<sup>23</sup> Child help lines aim to provide confidential advice and support, free of charge, to children and young people. In fact '116000', '116111' and '116123' have all been standardised in the EU, with '116000' for reporting missing children, '116111' for helping children and '116123' for helping adults.

<sup>24</sup> As there can be competing directory enquiry services, '118' might need to be followed by further digits.

<sup>25</sup> However, the regulator might still specify a number range to be used.

- Among the customer care numbers and general contact numbers of different operators are '100', '101', '121', '141', '151', '333', '347' and '888', and some other short numbers might be well established<sup>26</sup>.

Short numbers are sometimes made available to organisations not involved in telecommunications, such as businesses, government agencies, content service providers and call centres. Some such organisations will want their callers to be able to reach them in the same way from all mobile networks; they will not accept that callers can contact them with a short number from one network but not from another. There could be an industry body allocating numbers that would be harmonised among the operators, but it would probably need to take on other responsibilities, such as consumer protection and dispute resolution. Also, some short numbers might not be harmonised, because a network regarded the content as part of its competitive appeal; for instance, just one network might want to offer an extended range of musical ring tones, or all networks might want to offer sporting results but with different sources and presentations. On the whole at this stage we suggest that NCA should be responsible for harmonising short numbers.

A reasonable aim would be to harmonise the short codes shown in Figure 10 that are largely harmonised in East Africa. An alternative aim would be for each operator to adopt the short numbers of current operators as well as their own, and for any new operator to adopt the short numbers of the existing operators, at least for the services mentioned in Figure 10. However, doing this would create impediments to interconnection, as ever more destinations would be exempt from being accessible from different networks. Accordingly here we suggest that in Somalia operators should support the short codes shown in Figure 10; these would be “short codes” (not just “short numbers”) that would be dialled on all networks without being prefixed by NDCs.

**Figure 10 Harmonisation of short codes in East Africa**

Country	Customer care	Emergency	Child helpline	Voicemail deposit	Voicemail retrieval	Credit recharge	Balance check
	100	112	116	121	123	130	131
Kenya	Yes	Yes	Yes	No	No	Yes, mostly	Yes, mostly
Rwanda	Yes	Yes, partly	Yes	Yes	Yes	Yes	Yes
Tanzania	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Uganda	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Recommendation 14** Operators should ensure that police, ambulance and fire emergency services, and child help line services, that are accessible through numbers on their networks are accessible also by '112' and '116' respectively, and that calls to such numbers are free of charge to the callers.

**Recommendation 15** Operators should ensure that services for customer care, voicemail deposit, voicemail retrieval, credit recharge and balance check that are accessible through numbers on their networks are accessible also by '100', '121', '123', '130' and '131' respectively.

<sup>26</sup> Somtel short numbers start with '1' and '3', with '100', '111', '151' and '152' for customer care, '101' and '335' for mobile money and '333' for general contact. Hormuud short numbers start with '1', '7' and '8', with '101' and '141' for general contact. Telesom short numbers start with '1', '8' and '9', with '100' for mobile money and '151' for general contact. Golis offers access to Sahal hot spots by sending texts to '412'.

A short code drawn from Figure 10 would provide access to points that might differ according to the network on which it was dialled. Other short numbers could usefully be made accessible from other networks if there was interconnection; this would be particularly convenient when access is needed (for fault reporting, for example) but some network end points are unusable. These other short numbers would simply be treated as conventional subscriber numbers and, as such, be subject to the same rules as other subscriber numbers, including those about prefixing them with NDCs.

**Recommendation 16** *Operators should make the services that are accessible through short numbers also accessible through national significant numbers by national dialling.*

Making short numbers be conventional subscriber numbers avoids clashes between the short numbers of different operators; otherwise such clashes are very likely to happen, especially if local dialling is available. The “send” indicator of the end of a number dialled from a mobile phone could be used to let short numbers coincide with first few digits of other numbers (so, for example ‘975’ might be a short number and ‘97 573 4821’ might be a mobile number), but this would be confusing. Similar remarks apply to short codes, so short codes and short numbers should not coincide with the start of the digits of any other numbers.

**Recommendation 17** *The dialled digits for one assigned number should not be identical with the start of the dialled digits for a different assigned number in the same NDC.*

**Recommendation 18** *The dialled digits for a short code should not be identical with the start of the dialled digits for an assigned subscriber number in any NDC.*

Short numbers can also be made more convenient by making the numbers used for voice calls, text messages and Unstructured Supplementary Service Data (USSD) match each other when the services match (especially now that good text-to-speech and speech-to-text applications are available). There are already some partial instances of this in Somalia, such as ‘992’ and \*992#’.

**Recommendation 19** *Short numbers for voice calls, text messages and USSD should be considered jointly, so that a service available by using more than one of these modes of communication is accessible though a single short number irrespective of which means of communication is used.*

## 7.2 Freephone numbers

Around the world, the most common choice of NDC for freephone services is ‘800’<sup>27</sup>. The length of freephone numbers is commonly the same as the length of mobile numbers, though it can be more or less, and sometimes part of the range is set aside for shorter, more memorable, numbers. In particular, vanity freephone numbers are often popular.

Though an NDC starting with ‘8’ could be allocated in Somalia now, it should not be allocated until there is clear demand for it. No such demand seems to have emerged yet, for freephone or other services that might need new NDCs.

**Recommendation 20** *NCA should protect all NDCs starting with ‘8’ until there is justifiable demand for new numbers that need to be distinctive.*

NDCs in Somalia currently have one or two digits. In these circumstances ‘80’ might be the NDC for freephone services but only numbers starting with ‘800’ would be allocated while possible.

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<sup>27</sup> The terms ‘freephone’ and ‘tollfree’ are used in this document to mean “free to the callers”. However, in some countries ‘freephone’ calls are not free when made from mobile phones, and in others ‘tollfree’ calls are charged at the same rate as local calls.

**Recommendation 21** *NCA should protect NDC '80' for future use in freephone services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers. Calls to such numbers should be free to callers inside Somalia; calls from outside Somalia should be charged on the same basis as other international calls, if the operator and the person assigned the number permit them*<sup>28</sup>.

### 7.3 Economy rate numbers

VOIP operators wanting national numbers may want to position their services as alternatives to fixed or mobile services, or as something different. In support of competition, numbering should give them the choice: they should be allowed to use fixed or mobile numbers, and, if there is clear demand, they should be allowed to use numbers set aside for VOIP.

There are in fact various kinds of VOIP number, but only one of these could have much effect on the demand for numbers<sup>29</sup>. It is the kind needed by Skype Number, Google Voice, WeChat and Viber (for example), in which national or international calls to the number are connected to it or to a fixed or mobile number that has been associated with it.

In some countries VOIP numbers do not exist; in other countries they do exist, but their NDCs show little uniformity between the countries. Often the numbers have proved much less popular than expected, as have numbers for other slightly unusual services: operators and customers prefer familiar fixed or mobile numbers, because they avoid the connotations of “exotic tariff arrangements” (unlike premium rate numbers, for example) and permit simple comparisons of their tariffs with those of other familiar numbers. Calls to VOIP numbers indicate to callers that the services are different from fixed and mobile services, but that might not be welcomed.

If VOIP numbers are wanted, the services might be marketed as independent of location or as inexpensive. However, services that are independent of location invite comparison with mobile services; they can compete against such services only by being less expensive<sup>30</sup>. This makes them like services that elsewhere are called “local rate” services; these resemble freephone services, except that calls to them are not free but are charged at a modest rate, which may match that of a fixed network local call or be capped at a certain affordable level. Such services can be popular for help lines, customer care, and order placement. They tend to use numbers which resemble freephone numbers in some way. The approach here is to generalise VOIP numbers to “economy rate” numbers like these.

**Recommendation 22** *NCA should protect NDC '81' for future use in economy rate services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers. Calls to such numbers should be charged on a basis no less favourable to customers than that for fixed and mobile calls made from the same point.*

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<sup>28</sup> The number might be chosen to indicate whether international calls are accepted in Somalia, to enable remote gateways to block traffic that is not accepted. However, doing this may not be possible while complying with the E.164 limit to seven-digit analysis (including the country code) on international routing.

<sup>29</sup> For analyses of the kinds of VOIP number, and discussions of the affects on demand, see *The evolution of geographic numbering in Ireland - consultants' report* (Antelope Consulting with Analysys Mason, December 2013) at <http://www.comreg.ie/fileupload/publications/ComReg13122.pdf>.

<sup>30</sup> In theory they could compete by offering higher quality (perhaps going so far as to use wideband voice coding). However, that seems unlikely, when mobile networks are mature enough to offer reliable service quality.

## 7.4 Premium rate numbers

Normal consumer protection requirements (such as price transparency and delivery of advertised items) should apply to services accessed through telephone numbers. In particular, the charges for calls to unfamiliar numbers should be clear to callers. This may be achieved through the structure of the number (for example, with higher charges corresponding to higher first digits) or through uncharged initial messages (for example, “this call will cost 30 shillings a minute; please press 1 to continue it”). In addition paid-for content must be accurate and complete.

Premium rate services offer content that is charged at a high rate, part of which is passed on to the content provider. Voice content services are becoming less popular with the growth in use of the internet and smart phones, but text content services, using short numbers on mobile phones, are still common. However, some services (such as those offering subscription text messages) need quite complicated rules to prevent wrong-doing. For Somalia, where such services are not yet widespread, banning them might be more beneficial than permitting them subject to complicated rules.

**Recommendation 23** *To simplify the protection requirements while still permitting content services NCA should require that any content service, whether to a short number or to a premium rate number, be charged on a basis amounting to no more than twice the rate applicable to a conventional person-to-person call made from the same national or international end point.*

A frequent choice of NDC for premium rate services is ‘900’, but in Somalia ‘90’ is already used for mobile numbers.

**Recommendation 24** *NCA should protect NDC ‘89’ for future use in premium rate services. If demand for these services emerges NCA should allocate the numbers in blocks of 1,000 nine-digit numbers.*

## 7.5 Machine-related numbers

IOT services such as building protection and vehicle tracking have used fixed and mobile numbers for several years. The number of IOT services available is now growing fast, because cheap sensors and actuators allow useful communication with small items of equipment. Much of this communication will need IP addresses but not telephone numbers; however, some will need telephone numbers. So far operators have usually preferred to handle IOT services using their existing numbers, but the services might need their own range of numbers if demand grows greatly. Also, organisations that do not provide telecommunications (such as car manufacturers) might have reasonable claims to their own numbers, in which case they could become like Mobile Virtual Network Operators (MVNOs) for numbering purposes and extra licenses might need to be issued if eligibility for allocations was to remain tied to holding licenses<sup>31</sup>.

IOT numbers are “machine-related”: they are usually dialled by machines, not by human beings. They can therefore be long and difficult to remember. As there could be many of them, they should be given the maximum permissible length, which in Somalia is twelve (as ITU-T Recommendation E.164 places a limit of fifteen on the length of the country code together with the NSN).

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<sup>31</sup> For arguments for and against introducing IOT numbers, and discussions of the affects on demand, see *The provision of machine-to-machine numbering in Ireland - consultants' report* (Antelope Consulting with Analysys Mason, November 2013) at <http://www.comreg.ie/fileupload/publications/ComReg13110.pdf>.

**Recommendation 25** *NCA should protect a currently vacant two-digit NDC that is not especially attractive to humans, such as '86', for future use in machine-related services. If demand for these services emerges to an extent that the existing fixed numbers or mobile numbers risk exhaustion NCA should allocate the numbers in blocks of 1,000,000 twelve-digit numbers.*

## 8 Number administration

### 8.1 Numbering applications

NCA is responsible for granting or refusing applications to it for allocations of numbers. The National Communications Act, 2017, outlines the grounds for refusal. NCA should normally grant speedily applications that are properly completed and fully justified by appropriately licensed operators. However, NCA can question any application which it suspects of containing errors, omissions or misrepresentations and can choose the numbers to be allocated in accordance with its rules for ensuring the availability of numbers in the future.

**Recommendation 26** *NCA should deal with complete applications for allocations of numbers within thirty days, other than in exceptional circumstances.*

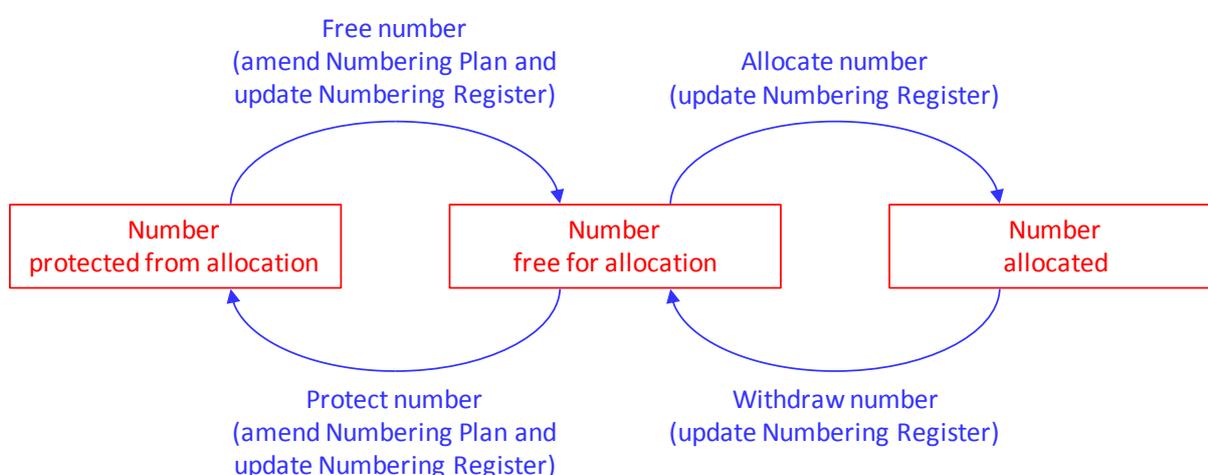
NCA might withdraw allocated numbers, for various reasons; for instance, the claims for numbers by operators might exceed greatly the demand for numbers from customers, as exhibited in Figure 8. However, NCA and the operators should be reluctant to make any changes to numbers that might inconvenience users.

**Recommendation 27** *NCA should withdraw allocated numbers only if they are not used, they are used in ways contrary to the Numbering Regulation, or they are needed for other purposes because of a number change (which itself should be the subject of a public consultation).*

In some countries numbers can be reserved for limited periods of time without being allocated. Reservations are usually intended to streamline allocations by identifying in advance preferred numbers for allocation to each operator. However, they are not used very often, perhaps because they are complicated when two operators apply for reservations of the same numbers, to be allocated to the one winning a particular contract with a customer. The introduction of reservations into Somalia is not proposed here, to simplify the process of handling applications.

When applications for allocations of numbers are granted, the numbers allocated come from the numbers that are free for allocation. Some numbers, however, should not be free for allocation but should instead be protected from allocation to permit possible expansion of the Numbering Plan. A number can therefore be in one of three states: allocated, free for allocation and protected from allocation. Figure 11 shows these states and the transitions that might be made between them.

**Figure 11 Possible transitions between states of number availability**



Sometimes an operator might allocate numbers to another operator. This can be convenient if, for example, the other operator is an MVNO that concentrates on providing services to a particular target market and that does not want to build its own infrastructure. In these circumstances the responsibility for the numbers remains with the operator to whom NCA allocated them.

**Recommendation 28** *Operators that allocate numbers to others should remain responsible for compliance with the Numbering Regulation for the allocated numbers.*

## 8.2 Numbering audits

The Numbering Register records numbers that have been allocated, so that applicants for allocations know what is available.

**Recommendation 29** *NCA should publish the Numbering Register, showing which blocks are allocated and to whom these blocks are allocated. Publication should be by upload to a website, with copies distributed to all of the operators.*

When numbers are allocated, the Numbering Register held by NCA, and the numbering records held by the operators, must be amended. To ensure that the Numbering Register and the numbering records stay in step with one another, the operators periodically provide the records to NCA for comparison with the Numbering Register.

**Recommendation 30** *Operators should provide numbering records to NCA annually. These should indicate how many numbers are assigned, and how many numbers are assignable, for each NDC.*

**Recommendation 31** *NCA should audit the Numbering Register annually.*

## 8.3 Numbering reviews

A first requirement for making sure that people keep to the Numbering Plan is to make it publicly available.

**Recommendation 32** *NCA should publish the Numbering Plan, showing at least the usages of blocks that are allocated or free for allocation. Publication should be by upload to a website, with copies distributed to all of the operators.*

NCA should review numbering annually. The main purpose of the review is to highlight new developments and possible needs for changing numbers, in plenty of time for due consideration and eventual change. The details of existing number allocations and the forecasts for planned future demand from the operators will be invaluable for this purpose.

**Recommendation 33** *NCA should review the Numbering Plan annually.*

## 8.4 Numbering charges

The National Communications Act, 2017, permits charges for numbers but does not state the intention behind doing so. Internationally, the following intentions are found:

- To encourage the conservation of numbers. Operators that use numbers efficiently, with numbers as long as permitted, can return unused blocks to make savings (as in Australia, Bahrain and Denmark, for example, where charges are proportional to the numbering space occupied, so one three-digit number costs as much as 100,000 eight-digit numbers).
- To limit demand for scarce numbers. For instance, in the UK over the years various small operators were allocated most of the numbers in some geographic areas; introducing charges has decreased the demand for numbers and increased the supply of numbers.

- To reflect the value of the vanity numbers included in allocated blocks. For instance, in Singapore the standard charge per block assumes that every block contains the same number of vanity numbers with the same standard charge per vanity number.
- To cover the regulatory costs of number management and administration. EU legislation, for example, limits charges for numbers to cost-recovering levels (except for vanity numbers that have “exceptional economic value”).
- To raise government revenues from the industry, in a competitively fair manner. Allocated numbers have been used in some countries, for example, as the basis for assessing universal service levies (though turnover is now the usual basis).

The last three of these appear to be rare, because revenues can be raised and costs can be covered in other ways, such as by general regulatory fees and number sales taxes, which can save administrative overheads. Taxes on sales of necessities (as mobile telephony is rapidly becoming) should be avoided, as they affect poor people particularly severely. Taxes on sales of luxuries, such as vanity numbers, are more appropriate.

Taxes on sales to customers of vanity numbers should be distinguished from charges to operators for vanity numbers. Such charges are difficult to set justifiably, because the regulator must either hold auctions of vanity numbers or define the patterns in vanity numbers. Auctions of numbers by regulators are very rare; they no longer occur in Australia, which used to be where they were best known. Any definition of the patterns in vanity numbers can be challenged, because some apparently attractive numbers do not fit. For instance, nine-digit numbers with five occurrences of any digit, such as ‘97 511 1811’, or with three ‘0’s in alternation, such as ‘97 503 0801’ (“ninety-seven fifty thirty eighty one”), might be ruled out. Some countries have vanity numbers that translate into words by the standard key pad mapping (as in ‘0800 flowers’ in the US), through their sounds (as in ‘88’ (“doubly fortunate”) in China), or some other encoding (as in ‘786’ (“bismallah”) in Bangladesh)<sup>32</sup>.

Elsewhere government revenues can be raised specifically from telecommunications by charging operators for scarce resources, but the charges usually relate to spectrum, not numbering. The use of spectrum is often easier to monitor and value than the use of numbering; also, charges for spectrum add to the incentives to improve encoding and transmission techniques, in ways that charges for numbering are unable to match. Hence charges for numbering are not very common; where they occur, they can be quite varied, as the examples in Figure 12 show.

**Figure 12 Variety in charging for numbers in East Africa**

Country	Initial fee (USD/application)			Annual fee (USD/number)		
	Fixed	Mobile	Special	Fixed	Mobile	Special
Kenya	0	0	0	0	0	0
Rwanda	60	60	60	0.96	0.96	0.96
Tanzania	0	0	2,000	0.20	0.20	1,000, 5,000
Uganda	0	0	0	0	0	0

<sup>32</sup> For arguments for and against charging for vanity numbers, and definitions of patterns defining vanity numbers, see *Special numbers in the United Arab Emirates* (Antelope Consulting with Frontier Economics, August 2015) at [http://www.antelope.org.uk/publications/Special\\_numbers\\_in\\_the\\_United\\_Arab\\_Emirates.pdf](http://www.antelope.org.uk/publications/Special_numbers_in_the_United_Arab_Emirates.pdf).

Shortages of numbers can result from inefficient uses; examples of such uses occur when assigned numbers are scattered at few points throughout allocated number blocks or have only three digits though they could have seven. Hence any charges should apply to the space that the allocated blocks make unavailable to others. In particular, charges might be imposed if blocks claimed by the operators before the introduction of effective regulation are unable to be withdrawn because some numbers within them are assigned.

**Recommendation 34** NCA should retain reserve powers to charge for numbers, at levels expected to avoid inefficient use. The charges for a number block should then be calculated as if all of the numbers in the block have the maximum allowed length appropriate to the usage of the block, regardless of their actual lengths.

## 8.5 Number sales

As Figure 13 illustrates, number trading can emerge when some numbers are regarded as desirable. It can appear in small advertisements by individuals, web sites of number traders, or special tariff packages from operators. There is a risk that number traders will hoard numbers: they might extort high prices from customers who just wanted to choose numbers that were special for personal reasons, or place pressure on the regulator to allocate more numbers even though the utilisation of the allocated numbers was low. This is alleged to happen in the US, where one company has held 25% of the freephone numbers<sup>33</sup>. However, in Somalia the powers of NCA to refuse unjustified applications for allocations and to withdraw unassigned numbers should be sufficient to inhibit number hoarding by operators when the Numbering Register is well established.

**Figure 13** The desire for special numbers

There might be circumstances in which one operator dominates the market, especially for fixed network services. In these circumstances upper bounds on charges can be important to consumer protection. This applies to the numbers for services just as to the services themselves.

<sup>33</sup> In fact number trading is not permitted in the US, but number leasing, and trading in companies whose only assets are their numbers, are permitted.

**Recommendation 35** *NCA should regulate the charges by operators for numbers only in the same circumstances as it regulates the charges by operators for services, which are typically when an operator has significant market power.*

NCA is unlikely to have any direct legal authority over number traders other than operators. To limit the activities of such traders NCA would need to place requirements on the operators, such as recycling numbers not brought into service for ninety days after being assigned. However, there is no clear need to do this. Moreover, though number trading might be discouraged, it is likely to happen if there is demand; after all, selling numbers can masquerade as selling phones, SIMs or even companies<sup>34</sup>. Regulations that are not enforced ultimately lead to disrespect for the rule of law.

More important than inhibiting number trading is ensuring that customers understand the rights of use of numbers assigned to them. These rights might include:

- Making and receiving calls on the numbers.
- Publicising and hiding the numbers through the use of advertisements, directories and ‘do not call’ registers.
- Avoiding unwanted calls, whether malicious, fraudulent, from sales people, or for popular incorrectly dialled numbers.
- Buying and selling the numbers.
- Keeping the numbers, subject to contractual conditions (such as compliance with the numbering plan) and practical considerations (such as exchange areas and portability details).

If the numbers need to be changed the regulator can withdraw them. If the numbers remain inactive for long enough the operator can recycle them.

There are schemes for “extended rights of use”, to let numbers be kept inactive for three years without being recycled. The merit of such schemes is very questionable, and very few countries have introduced them. Having uniform simple rights of use for all numbers seems preferable, but the rights need to be made known to customers.

**Recommendation 36** *NCA and the operators should bring the rights of use of numbers to the attention of customers.*

## 8.6 Number misuse

A former problem was that content providers in other countries used international calls to Somalia to evade premium rate service rules in their countries. The current problem is that users are deceived (typically by being left messages) into calling back numbers to which high tariffs apply.

The calls might “stop short” of Somalia, terminating on numbers outside Somalia. This might be because the numbers have been wrongly opened to international traffic, when foreign operators have misinterpreted the structure of numbers in Somalia such as those in Figure 2 or have implemented notifications of the use of vast ranges of numbers, such as those in Figure 8.

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<sup>34</sup> A survey by the consultants of regulations about vanity numbers in seventeen countries (mainly in Europe, the Middle East and south Asia) established that only three prohibited number trading. Numbers were openly advertised as being for sale in all seventeen countries, despite formal prohibitions.

Figure 14 lists the nine most common first and second digits in current “call back” (to Somalia) fraud attempts according to one web site; together they account for 38% of the total<sup>35</sup>. These damage the reputations of the operators in Somalia; withdrawing blocks in which no numbers are assigned, and monitoring the usage of blocks in which numbers are assigned, might help. However VOIP makes it easy for telemarketers and fraudsters to invent calling line identities and exploit anonymity provisions intended to protect personal privacy. Technical solutions for authenticating calling line identities are taking years to reach maturity; until they do so fraud attempts will persist.

**Figure 14 The most common “call back” fraud first and second digits**

First and second digits of National Significant Numbers	Proportions of misused numbers with these digits (%)
99	9
70	5
50	4
30	4
20	4
55	3
44	3
61	3
37	3

## 8.7 Number changes

Any suggestions to change numbers should be treated cautiously. In fact:

- The costs of numbering changes can fall heavily on the users: if their numbers change they need to change their letter heads, shop signs and vehicle signs, and if the numbers of their contacts change they need to update their address books.
- There are, of course, significant costs to the operators in changing numbers, but perhaps even more important than these are the effects on revenues. In particular, if customers are told that their fixed network numbers are changing they might well choose to abandon the fixed network completely rather than pay for connections that fewer people will use.
- Even limited changes to the numbering plan can easily go wrong; co-ordinating the publicity and rerouting requirements is difficult enough, without replacing the switches at the same time. Extensive changes, where such changes have never been attempted before, are very likely to go wrong.

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<sup>35</sup> These nine first and second digits account for 113 of the 298 numbers with country code ‘252’ listed at <https://whocallsme.com/Phone-Number.aspx>. Over 10,000 calls from them were reported in Sweden during some days, according to <https://www.thelocal.se/20170529/beware-new-252-telephone-scam-swedish-police-warn>.

Changes to a numbering plan might happen in stages over a period of years, rather than (as in some countries) all at once on a given day. The staged approach is easier to manage, as it has a flatter manpower profile and can better survive unforeseen obstacles and delays. However, publicity for the changes has to continue over the full period, and be targeted throughout towards the correct part of the public; hence in some countries (such as France) rapid changes, with little or no parallel operation of the old and new numbering have been preferred.

When planning a number change, the need to inform callers to obsolete numbers about the correct new numbers must be borne in mind. It is good practice to make an announcement such as:

- “This number has been changed to ‘95 573 4821’.”
- “Numbers in this area have been changed; the new number starts with ‘95’ instead of ‘97’.”
- “The area code for ABC has been changed from ‘97’ to ‘95’.”

In each case, the announcement might be followed by one of:

- “Your call will now be connected. Please note the new number for next time you call.”
- “Please dial again, using the new number.”

Announcements like these are usually provided for some months after a change. Later, the old numbers can be connected instead to a general announcement saying “Numbers in Somalia have changed. Please call [a help line number], message [a short number] or see [a web site] for more information”. Later still, the old numbers can be connected to the number unobtainable tone, or (where appropriate) reused.

Identifying calls which should be routed to changed number announcements is easiest if only the first few digits (preferably only the first digit) need be analysed to distinguish between the new numbers and the old numbers. If this is impossible, then the distinction must depend on the lengths of the numbers. For calls dialled from mobile phones the “send” indicator establishes the lengths, but for calls dialled from fixed lines, digits might need to be counted.

The quantity of different changed number announcements needed, the quantity of simultaneous changed number announcements needed and the level of incorrect dialling expected depend on the complexity of the changes, which might coincide with service improvements.

Any directory enquiry service might well be overloaded during the change period. Tables allowing callers to look up new numbers from old numbers could be provided, with access possible via voice or text query, or online.

Operators will need to make changes not only in exchanges but also to their operational support systems, billing systems and so on. Businesses with private networks will also have to make various changes to their own systems; most businesses will need to change their publicity materials. All this is made easier by generous advance notice of changes and periods of parallel running of old and new numbers. Informative leaflets and checklists could help.

The regulator is responsible for informing the ITU of forthcoming numbering changes that affect international connections, giving as much notice as possible. Operators will want also to ensure that international correspondents with which they have direct interconnections are fully informed.

**Recommendation 37** *Numbers should be changed only if the costs of doing so are justified by the benefits.*

**Recommendation 38** *If numbers are to be changed, NCA and the operators should observe, and agree on details of, guidelines like those provided here.*

## 8.8 Number portability

Figure 15 compares some features of the proposed regulatory environment in Somalia with those in the twelve benchmark countries. The features in Somalia are not out of line with those elsewhere, except perhaps for number portability. Supporting number portability entails first providing interconnection, considering factors that affect when number portability should be introduced, and developing conditions that help to make number portability successful. Here there is an outline of some of these factors and conditions.

**Figure 15 Some numbering regulation implications**

Country	Local dialling allowed	Cross-border dialling supported	Carrier selection supported	Short Code harmonisation supported	Secondary allocation allowed	Number trading allowed	Number portability supported	
							Fixed	Mobile
Burundi	No	No		No			No	No
Djibouti	No	No	No	Yes	No		No	No
Egypt	Yes	No	No	No		Yes	No	Yes
Eritrea		No	No	Yes	No		No	No
Ethiopia		No	No	Yes	No		No	No
Kenya	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Nigeria	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Rwanda	No	Yes		Yes		No	No	No
South Africa		No	Yes	Yes	Yes	No	Yes	No
Tanzania		Yes	Yes	Yes	No	No	No	Yes
Tunisia		No	Yes	Yes		Yes	Yes	No
Uganda	Yes	Yes	No	Yes	No	No	No	No
Somalia	Yes	No	No	No	No	Yes	No	No

Number portability can be:

- Location number portability. This involves keeping the same phone number when changing from one location to another. When networks become based on IP, number translation and routing depend on fewer nodes, so numbers become portable over larger areas and lose geographic significance. Location number portability should ultimately be very easy.
- Service number portability. This involves keeping the same phone number when changing from one service to another (from cdmaone to GSM, for example). Differences between services can be difficult to define, especially for IP applications: to one customer an application may offer only voice whilst to another customer it offers text and video as well. Service number portability is therefore made easier by not using numbers to differentiate between services.

- Operator number portability. This involves keeping the same phone number when changing from one operator to another. Customers may change their operators in order to improve their services, so operator number portability, like service number portability, is made easier by not using numbers to differentiate between services (or, of course, between operators).

In Somalia, operator number portability, or more specifically operator mobile number portability, is the form of number portability likely to have greatest relevance. The main argument for introducing it is that it stimulates competition and perhaps demand, both before its introduction and after its introduction. Small businesses and many consumers dislike changing their numbers, so when there is operator number portability they are more likely to choose the tariff and service packages that suit them best.

Factors affecting when operator number portability should be introduced include:

- The area and population for which services are realistically available. At least in the early stages of market development introducing operator number portability might distract operators from other national priorities, such as ensuring thorough network coverage, and operators might focus on competing for the existing (relatively high value) customers, not on extending service to customers with low incomes or outside cities.
- The level of wholesale termination charges. Operator number portability can increase market concentration when it might be expected to decrease it: if one operator is already larger than the others and on-net tariffs are much lower than off-net tariffs, customers will be attracted to the larger operator, which their contacts use. The tariff differences are influenced strongly by the wholesale termination charges.
- The projected rates of porting. The porting process might take some time to settle down and be used confidently and frequently; only later would the quantities of ported numbers grow. This possibility can affect the choice of portability implementation. Many portability implementations use centralised reference data bases, especially when there are several operators. Those that do not use centralised reference data bases tend to have higher operating costs but lower capital costs than those that do, so they can be more economical for low rates of porting but less economical for high rates of porting; however, the vendors of centralised reference data bases, with “build and operate” contracts, might raise their operating costs to absorb the capital costs.

Customer surveys can help with determining whether wholesale termination charges are too high (in that they discourage customers from making off-net calls) or whether the projected rates of porting are realistic, but they need to be treated cautiously: they are likely to overstate how keen people are to port numbers and how successful operator number portability will be. In fact when operator number portability is introduced it is likely to be successful only if:

- It is well publicised and widely understood.
- It is simple, quick and free for the customer, involving only one point of contact (with the operator to whom the number is being ported).
- It lets customers terminate contracts without incurring disproportionate charges for giving up services or keeping subsidised handsets.

Mobile numbers are becoming identifiers that are important for other purposes, so the ability to port them is now widely regarded as a user right. Nonetheless, prepaid customers that discard their SIMs (and therefore their numbers) after some months might not use operator number portability.

**Recommendation 39** *When competing mobile networks are interconnected, NCA should review periodically whether the networks serve enough customers with low incomes and outside cities for operator mobile number portability to be introduced.*

**Recommendation 40** *NCA should ensure that wholesale termination charges are low enough not to discourage customers from making off-net calls, regardless of when operator number portability is introduced.*

Some benefits of number portability might be achieved at lower cost, through free recorded announcements to let callers know when customers change their numbers and what calls to the changed numbers might cost. Free announcements could also offer to connect calls to the changed numbers for stated tariffs.

A scheme sometimes known as “subscriber number portability” might be an alternative to operator number portability. It lets customers keep all the digits of their numbers except for those identifying the service provider, so (for example) ‘97 573 4821’ might be changed to ‘95 573 4821’, if the latter number is unassigned. This scheme was used for some years in Ireland, but it was widely regarded as not delivering the expected benefits and was replaced by operator number portability. Normally unassigned numbers are not easy to match in competing operators at varied stages of growth. However, in Somalia many allocated numbers are inactive and could be unassigned, so the scheme might be feasible.

**Recommendation 41** *NCA and the operators should consider, as an interim alternative to operator number portability, setting aside some number blocks for matched assignment by all of the operators, so that a customer assigned a number in such a block by one of the operators is entitled to be assigned the matching numbers by all of the operators.*

## **8.9 ENUM**

Networks depend on the Internet Protocol (IP) to an increasing extent, even when their users have traditional phones, with phone numbers. If phone numbers are to be used in IP networks, they must be mapped to IP addresses (for call destinations or for gateways into other networks). ENUM is one among various tools for helping to perform this mapping.

Strictly speaking, ENUM is purely the representation of a phone number to a domain name. It works with the internet Domain Name System (DNS), which can map each such domain name to several communication services, with different end points, ranked by preference. The end equipment then chooses one of the communication services according to the preferences and its own capability. It makes a further reference to DNS to obtain an IP address for the chosen communication service before initiating the communication.

Working with the internet DNS, ENUM can associate phone numbers with end points for OTT services such as VOIP, but it does not itself provide any communication services. Various widespread VOIP services, such as Skype, do not use ENUM, even though some, such as Viber, associate end points with phone numbers. Conversely, ENUM can be used in implementations of traditional telephony network features (such as number portability).

ENUM is defined generally, independent of numbering plans at any level other than the country codes. It does not need to be related to numbering plans and number allocation policies in other respects. It does not require changes to national number plans. In some countries special number ranges have been introduced for use with ENUM; they have not proved popular, and other number ranges can still be used with ENUM, so they should not be developed.

ENUM was devised many years ago but has never been widely adopted. There have been trials in many countries, but there have been no mass deployments of ENUM in its original form, and end equipment that can exploit ENUM in its original form is very difficult to find. The trials confirmed that ENUM had various problems, due to the use of ENUM by customers.

There are now variants of ENUM that avoid these problems; they use essentially the ENUM representation of phone numbers and the DNS technology without making them publicly accessible: only operators can provide or retrieve the information<sup>36</sup>. Such a variant might be for use by just one operator (in the core network multimedia subsystem of an NGN, for example) or for use by subscribing operators (in the “Pathfinder” system for international GSM routing, for example). It raises no regulatory difficulties beyond those of any system that operators collectively adopt, such as a centralised reference data base for number portability.

***Recommendation 42*** *NCA and the operators should ensure that, in any collectively adopted ENUM system, user information is up-to-date and not accessible from the public internet, all operators can be offered non-discriminatory pricing for the use of the system, and the system supplier is selected openly and reviewed periodically.*

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<sup>36</sup> For arguments for and against introducing ENUM systems, and suggestions about trials, see *The potential for ENUM in Qatar* (Antelope Consulting, September 2013) at [http://www.antelope.org.uk/publications/The\\_potential\\_for\\_ENUM\\_in\\_Qatar.pdf](http://www.antelope.org.uk/publications/The_potential_for_ENUM_in_Qatar.pdf).

## 9 Other numbering systems

### 9.1 Established international requirements

Various other numbers besides those defined in ITU-T Recommendation E.164 are significant for telecommunications regulation and are specified to some extent in ITU recommendations<sup>37</sup>. They are not seen by users, so they rarely create problems for regulators. However, possibly one operator might withhold from another information about allocations or might create shortages by having wasteful allocations. Certainly ITU has not published all the information about these numbers that operators worldwide need<sup>38</sup>. If these numbers are used in competing services the regulator must take formal responsibility for them (though it might delegate their administration to service providers). Figure 16 summarises the attributes of these numbers.

**Figure 16 Internationally established codes**

Structure	Identified entity	Allocation duties	Limits	Standard
International Signalling Point Code (SPC) = Signalling Area Network Code (SANC) + Signalling Point Identification (SPI).	A source or destination in a signalling network	ITU: SANCs, Regulator: SPIs	1,536 SANCs, 8 SPIs per SANC	Q.708
National Signalling Point Code (SPC) = Signalling Area Network Code (SANC) + Signalling Point Identification (SPI).	A source or destination in a signalling network	Regulator: SANCs, Operator: SPIs		
International Mobile Station Identity (IMSI) = Mobile Country Code (MCC) + Mobile Network Code (MNC) + Mobile Subscriber Identification Number (MSIN).	A home country, a home network and a roaming subscriber	ITU: MCCs, Regulator: MNCs, Operator: MSINs	1000 MCCs, 100 or 1,000 MNCs per MCC, 10,000,000,000 or 1,000,000,000 MSINs per MCC	E.212
Data Network Identification Code (DNIC) = Data Country Code (DCC) + Network Digit (ND), Network Terminal Number (NTN)	A source or destination in a public data network	ITU: DCCs, Regulator: NDs, Operator: NTNs	900 DCCs, 10 NDs per DNIC, 10,000,000,000 NTNs per ND	X.121
Telex Network Identification Code (TNIC) = Telex Destination Code (TDC) + Telex Number (TN)	A source or destination in a telex network	ITU: TNICs, ITU: TDCs Regulator: TNs, Operator: TNs		F.69

International Signalling Point Codes (ISPCs), particularly the Signalling Point Identifications (SPIs), and International Mobile Station Identities (IMSI), particularly the Mobile Network Codes (MNCs), are needed. In these two cases, the regulator needs to observe the rate of allocation and, when supplies are exhausted, request from ITU the allocation of new Signalling Area / Network Codes (SANCs) or Mobile Country Codes (MCCs), as appropriate, in the manner described in the ITU

<sup>37</sup> The list at <http://www.itu.int/en/publications/ITU-T/Pages/publications.aspx?parent=T-SP&view=T-SP1> indicates what the ITU has defined for publication.

<sup>38</sup> For instance, ITU has not published the Mobile Network Codes for Somalia, but lists of them (which conflict with one another) are available at <http://www.imei.info/operator-codes> and <http://mcc-mnc.com>.

recommendations<sup>39</sup>. However, Data Network Identification Codes (DNICs) and Telex Network Identification Code (TNICs) are unlikely to be needed because of advances in technology: DNICs are still used, but only in private networks (for money transfers within or between banks, for example), and TNICs have given way to telephone numbers for fax machines, which themselves are giving way to electronic mail addresses.

National Signalling Point Codes (NSPCs) are not standardised internationally; however, in Somalia, as usually elsewhere, they have attributes like those of ISPCs in Figure 16. Thus they have SANCs and SPIs and are written in the form 'A-BCD-E', where 'ABCD' is the SANC and 'E' is the SPI. In the case of Somalia, ISPCs are likely to have first digit '6' (at least until a shortage of ISPCs leads to the pooling of the spare ones); to avoid confusion, therefore, NSPCs should not have first digit '6'.

## 9.2 Occasional national requirements

In some countries there are codes that do not arise in international standards but that nonetheless are administered centrally because they need to be known by more than one operator. The requirement for such codes varies between countries; for instance, if there is number portability there might be routing numbers that in signalling are attached to the dialled numbers to identify the destinations of calls to those numbers when they have been ported.

Currently no such codes seem to be required in Somalia, but the need for them might arise.

## 9.3 Administering these numbering systems

**Recommendation 43** *NCA and the operators should ensure that the applications for allocations of internal network codes are considered efficiently. A possible test of this is whether they are granted or refused within one day of submission.*

**Recommendation 44** *NCA and the operators should ensure that the Numbering Register is maintained for internal network codes.*

**Recommendation 45** *NCA should notify ITU about any changes to the allocations of International Signalling Point Codes and Mobile Network Codes.*

**Recommendation 46** *NCA and the operators should consider whether any national standards for internal network codes are needed.*

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<sup>39</sup> There are at most 8 SPIs per SANC, so exhaustion of SPIs is likely, but there can be 100 MNCs for each MCC, so exhaustion of MNCs might be unlikely in Somalia.