# METHODOLOGICAL NOTE ON THE CHOICE OF TELEDENSITY BANDS

*Note by the ITU Secretariat, 30th September 1998*

## Background

In the Chairman's Working Document Rev. 2 (25th August 1998) submitted to the second plenary meeting of the Focus Group, the Chairman proposed the use of categories based on teledensity as a way of classifying countries for the purpose of defining target rates. The original proposals were based on six teledensity bands and the target rates were established as being the average of the lowest five published settlement rates in each band. Table 1 below summarises the original set of proposals discussed at the plenary meeting held 1-3 September 1998.

**Table 1: Target rates for direct relations (settlement rates) proposed in second revision of Chairman's Working Document**

*Based on current "best practice" settlement rates and measured in SDRs (US cents) per minute, according to groupings of countries / territories, based on teledensity at 1 January 1997 (T = telephone lines per 100 inhabitants)*

| *Teledensity band* | *$T \leq 1$* | *$1 < T \leq 5$* | *$5 < T \leq 10$* | *$10 < T \leq 30$* | *$30 < T \leq 40$* | *$T \geq 40$* |
|---|---|---|---|---|---|---|
| No. of countries / territories | 42 | 36 | 28 | 47 | 17 | 36 |
| "Best practice" rate in SDRs (US cents) | 0.344 SDR (46.0 US cents) | 0.300 (40.1 US cents) | 0.257 (34.1 US cents) | 0.221 (29.5 US cents) | 0.164 (21.9 US cents) | 0.063 (8.0 US cents) |

*Note:* "Best practice" is defined as the average of the lowest five published settlement rates in each category. Where there are several PTOs in one economy, the average is taken.

*Source*: Focus group Chairman's Working Document, second revision. Settlement rate data adapted from FCC. Teledensity data from ITU World Telecommunication Indicators Database.

At the Plenary meeting, there was broad agreement to follow this approach but it was suggested that further work was needed in respect of numbers of categories, the definition of target rates within each category, the cut-off date for published data, and additional sources of data. This methodological note responds to some of the concerns raised at the plenary meeting, it analyses an number of alternative scenarios, and presents a revised set of proposed target rates based on newly available data.

## Why use teledensity?

Several of the contributions to the Focus Group have acknowledged the necessity of finding some means of dividing countries / territories. Various contributions suggested using net settlements as a percentage of total telecommunications revenue (TAF Group, contribution 1), income groups (ITU Secretariat, contribution 18) or teledensity (OFTA, Hong Kong China, contribution 20). Ultimately an approach based on teledensity was chosen for establishing target rates and other factors will be taken into account for establishing the transition trajectory.

Teledensity is defined as the number of telephone main lines per 100 inhabitants in a particular country or territory. For the purposes of the Focus Group it has the following advantages:

- Up-to-date data is readily available, for virtually all major countries / territories, in the ITU's World Telecommunication Indicators Database;
- There appears to be a relatively strong, inverse correlation between teledensity and published settlement rates (i.e., the lower the teledensity, the higher the settlement rate), as shown in the ITU Secretariat's contribution 37. This would suggest that teledensity is also one of the causal factors explaining variations in underlying cost;

- Teledensity is a telecommunication-specific variable and is therefore not influenced as much as other variables by, say, exchange rate fluctuations, changes in commodity prices or inequities in the distribution of national wealth.

However, no indicator is likely to be perfect for the purpose of categorisation. Teledensity suffers a number of disadvantages:

- Teledensity may not provide the most accurate reflector of residential access to telecommunications (i.e., penetration of telephones in households), particularly in small island economies or others which have a high degree of tourism. For instance, Least Developed Countries, such as the Maldives, Cape Verde or the Gambia, have a relatively high teledensity due to services supplied to hotels, but a relatively low level of household telephone penetration. Equally, some countries / territories such as Bermuda or the Cayman Islands or Bermuda, may have inflated teledensity figures due to second homes or financial services.
- Teledensity can change relatively rapidly, either in an upwards direction due to rapid growth (e.g., China, Viet Nam) or in a downward direction due to, say civil war or neglect (e.g., Rwanda, Bosnia & Herzegovina). The categories defined may not therefore be stable over an extended period.
- Teledensity may be an imperfect measure of the general health of an economy, For instance, many of the countries of the former Soviet Union have relatively high teledensities but are Low Income in respect to the purchasing power of their national currencies.

The overall conclusion is that teledensity provides a stable platform for analysis, but needs to be tempered by other variables that would identify specific groups of countries / territories which might need to be treated differently. The case of small island states is explored in more depth below.

## Which teledensity categories?

Having chosen teledensity as the primary platform for classification, it is then necessary to choose how many categories to use, and what cut-off points to define. Considerations which are relevant in making this choice involve the following factors:

- The categories chosen should reflect the patterns observed in the underlying data structure. For instance, the teledensity category which contains the most economies (the **modal category**) is for teledensity below one which includes some 42 countries or territories (see Figure 1, left chart). For this reason, the below one category was chosen as a band in its own right.
- Equally, the categories chosen should be reflective of the **underlying population structure** (Figure 1, right chart). Some 72 per cent of the world's population lives in countries / territories with a teledensity of less than ten. This includes the world's two most populous countries: India, which passed from the teledensity below one category in 1994 and currently has a teledensity of 1.9; and China (Figure 2) which passed from the teledensity below five category in 1997 and currently has a teledensity of 5.6. For this reason, it is logical to have at least three teledensity bands between zero and ten.
- The categories chose should reflect **logical break-points** that have a theoretical grounding. For instance, there are relatively few countries / territories in the bands between 10 and 30 and they have a small population size. For that reason, in the original proposal, this band was treated as one. The basis for this is that countries which have attained a teledensity on 10 appear to have crossed some sort of critical mass threshold after which network expansion grows rapidly, in a self-sustaining manner. This is sometimes called the "teledensity transition" (see Figure 2). It appears that this transition is becoming easier and quicker over time. For instance, in the Asia-Pacific region, economies such as the Republic of Korea or Singapore have recently completed the transition in 7-9 years whereas, earlier, economies such as Australia or New Zealand took some 20-25 years. For these reasons, it is logical to compress the number of categories in the middle teledensity bands.
- The teledensity bands should contain **approximately the same number of countries / territories** in each to avoid the problem that individual bands have target rates which are artificially low (because they are based on too large a sample) or too high (because they are based on too small a sample. At the Plenary meeting, it was proposed (notably by New Zealand) that the number of countries / territories

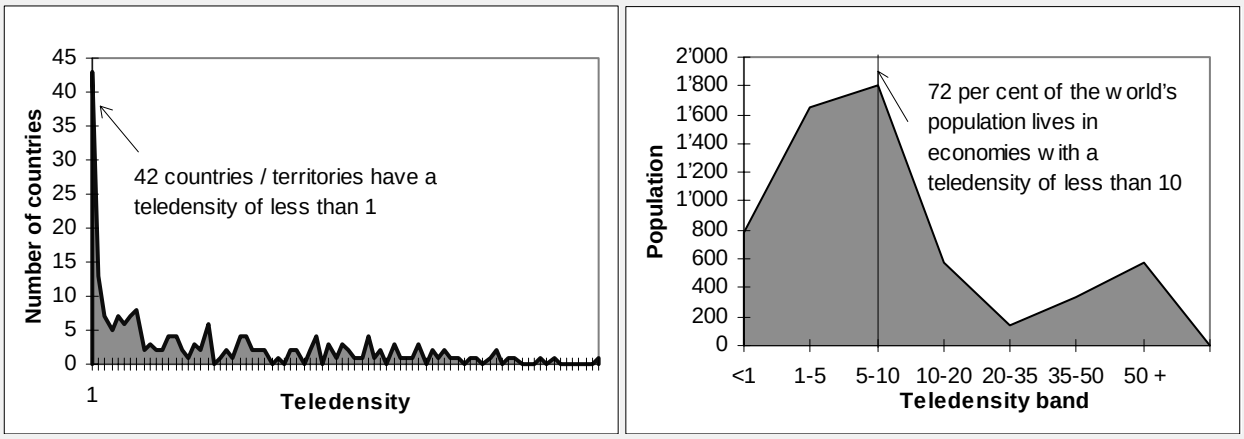
covered should be extended to cover smaller island states. The number has been expanded from 206 to 224. This makes it possible to increase the number of categories proposed from six to seven.

In discussions at the plenary meeting, some further problems were raised with the original categories proposed. Specifically, Trinidad & Tobago and others argued that the 10-30 category was too broad and covered countries / territories which were both at the beginning and the end of the teledensity transition. For that reason, it is proposed to split out the 10-20 and 20-35 bands as separate categories.

Second, Singapore argued that the 40 plus category covered too wide a range of countries including both those that had liberalised International Simple Resale and others that had not done so. KDD of Japan made a similar point, arguing that the 40 plus category compounded those countries / territories which had achieved a "sufficiently competitive market" with those that had not. Also, New Zealand expressed concerns that the 40 plus category included certain small island states (such as Anguilla or the British Virgin Islands) that were unlikely to experience competition in the short-term because of their limited market size. For these reasons, it is proposed to modify the higher teledensity bands into a 35-50 band and a 50 plus band.

**Figure 1: Characteristics of teledensity**

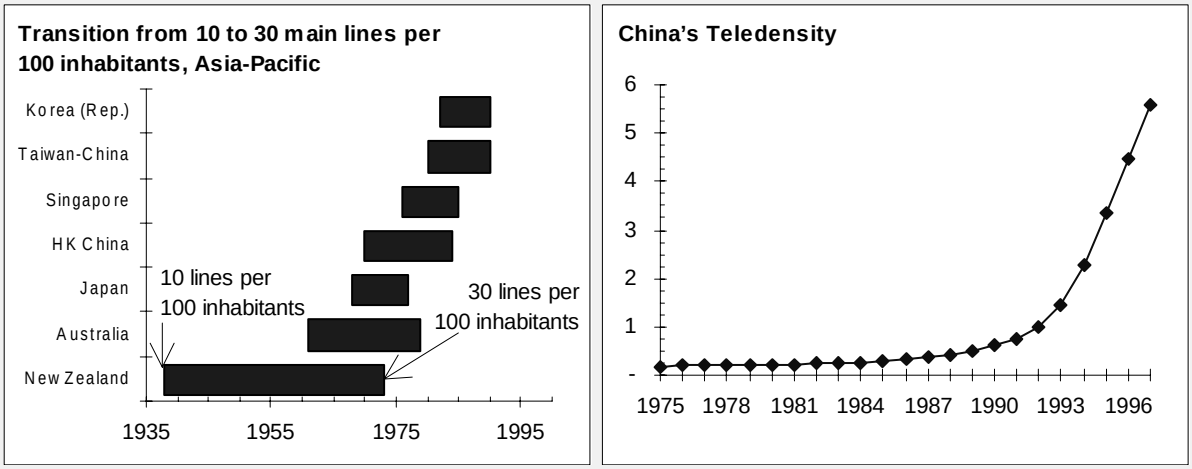
*Teledensity expressed in terms of number of countries / territories and by number of inhabitants*




*Source:* ITU World Telecommunication Indicators Database.

**Figure 2: Teledensity transitions in Asia-Pacific**

*Number of years taken to make the teledensity transition between ten and thirty, in selected Asia-Pacific economies, and China's teledensity evolution, 1975-97*




*Source:* ITU World Telecommunication Development Report, 1998.

**Table 2: Summary of proposed settlement rate levels for different teledensity groups**

*Settlement rate data is expressed in SDRs per minute. Teledensity (T = Telephone lines per 100 inhabitants) is valid for 1 January 1998.*

| | Group A | Group B | Group C | Group D | Group E | Group F | Group G |
|---|---|---|---|---|---|---|---|
| Definition | Teledensity<br>$T \leq 1$ | Teledensity<br>$1 < T \leq 5$ | Teledensity<br>$5 < T \leq 10$ | Teledensity<br>$10 < T \leq 20$ | Teledensity<br>$20 < T \leq 35$ | Teledensity<br>$35 < T \leq 50$ | Teledensity<br>$T > 50$ |
| No. of countries/ territories | 42 | 31 | 33 | 30 | 27 | 29 | 32 |
| Average settlement rate | 0.519 | 0.437 | 0.390 | 0.358 | 0.277 | 0.215 | 0.144 |
| Median settlement rate | 0.487 | 0.400 | 0.375 | 0.317 | 0.225 | 0.200 | 0.097 |
| Lowest settlement rate | 0.250 | 0.150 | 0.160 | 0.150 | 0.110 | 0.060 | 0.020 |
| Country / territory | Ghana | Albania | Tunisia | Libya | Hungary | Belgium | France |
| Average of lowest 20 % of settlement rates (**Target Rates**) | **0.317** | **0.247** | **0.210** | **0.162** | **0.122** | **0.088** | **0.040** |
| Countries / Territories | Ghana, DPR Congo, Angola Lesotho, Malawi, Uganda, Liberia, Benin | Albania, Algeria, Bhutan, Guatemala, Zimbabwe, Solomon Islands, | Tunisia, Bosnia, Mexico, Azerbaijan, Mayotte, Morocco, Brazil | Libya, TFYR Macedonia, South Africa, Poland, Yugoslavia, Romania | Puerto Rico, Hungary, Slovak Republic, Czech Republic, Bulgaria, Latvia, | Belgium, Italy, Guam, Ireland, Slovenia, Spain | France, Netherlands United States, Sweden, Norway, Switzerland |
| Highest Country / Territories | 1.307<br>Afghanistan | 0.815<br>DPR Korea | 0.65<br>Syria | 0.735<br>Iran | 0.65<br>St-Helena | 0.5<br>Ascension | 0.50<br>Falklands / Malvinas |
| Standard deviation | 0.198 | 0.162 | 0.138 | 0.171 | 0.144 | 0.120 | 0.118 |

*Notes:* Target rates are based on the average of the lowest 20 per cent of published settlement rates in each category available at 28 September 98. Each country/ territory is treated as single data item. Where there are multiple operators, the average is taken.

In the light of these considerations, it is proposed to modify the teledensity bands from the six proposed in the second revision of the Chairman's Working Document to seven, as shown in Table 2. The first three bands remain unchanged (below 1, 1 to 5 and 5-10). Thereafter, the higher bands are restructured so that 10-20 is identified separately (as requested by Trinidad & Tobago). Two bands are proposed between 20 and 50 with a breakpoint at 35. Finally, the highest band now covers the 50 plus teledensity category. By making the highest break point at 50 rather than 40, it meets some of the concerns raised by Singapore, KDD and New Zealand.

The proposed bands meet most of the criteria noted above. For instance, the modal category of below one is identified separately and the 1-10 category is split into two to reflect the high level of population in these countries / territories. With the exception of the below 1 band, all of the other bands have at least 27, and at most 33, countries / territories. Equally, the cut-off points appear to pick up relevant break-points in the underlying data structure.

As part of the analysis, a number of alternative scenarios were considered. These alternative scenarios are considered in an Annex to this document. While any of them would be adequate for the work in hand, none were considered optimal.

- In alternative scenario 1, eight categories were used with the higher bands restructured to reflect teledensity breakpoints at 1, 5, 10, 20, 30, 40 and 50. The main problem with this is that the bands are more diverse in terms of the number of countries / territories they contain. For instance, above one, they range between a minimum of 17 and a maximum of 33. It was felt that the choice of seven categories was superior because the range of sizes of bands was less diverse.
- Alternative scenario 2 takes a more radical approach in that, instead of fixing teledensity breakpoints, the number of countries / territories in each band is forced to be equal. Thus in a six band model, the first five bands would contain 38 countries / territories and the top one would contain 34. The result is that the bands have very irregular breakpoints. For instance, the lowest band breaks at a teledensity of 0.84. The main disadvantage is that this would impose a very rigid structure which would be very difficult to use in future (i.e., the bands would need to be changed every time the model was reviewed). Furthermore, the objective of having a similar number of countries / territories in each band could be achieved while still retaining bands with regular breakpoints. Thus this scenario was rejected.

## How low can you go?

Having addressed the issue of teledensity bands, the second issue which must be addressed is how to define the target rates in each band. In the 2nd revision of the Chairman's Working Document, the approach taken was described as "best practice". It involved taking the **average of the lowest five** countries / territories in each teledensity band and establishing this as the target to be attained. The results of taking the average of the lowest five for each teledensity band is shown in Alternative Scenario 3, in the Annex to this document.

Two concerns were raised at the Plenary meeting. The first was that the term "best practice", while describing a useful concept, might be interpreted to be setting a precedent which some countries, notably Mexico and Brazil, were not ready to accept. For that reason, in future versions of the Chairman's Working Document, the term "target rates" will be used rather than "best practice rates".

The second concern, raised by several countries including India, Jamaica, Trinidad & Tobago and Lebanon, was that the practice of using the average of the lowest five published rates would set targets which were are virtually unattainable for some countries. Furthermore, this methodology disadvantaged some teledensity bands relative to others in that the smaller the band, the more exacting the target. It was noted that the European Union, in its work on national interconnection, had used three out of fifteen EU Members (i.e., 20 per cent) to establish target rates. This figure of 20 per cent was considered by many to be more acceptable than the lowest five. It also avoids the methodological difficulty of having teledensity bands of variable size.

For that reason, in the new proposals contained in Table 2, the target rate has been established using the **average of the lowest 20 per cent** of countries / territories in each band. The lowest 20 per cent implies between six and eight countries / territories in each band. The results obtained range from 0.317 SDR (42.3 US cents) per minute in the below one band to 0.04 SDR (5.3 US cents) in the above 50 band.

An alternative methodology, which was favoured by some countries at the Plenary meeting, would be to use the **median value**, within each teledensity band. This would be equivalent to setting the target at the midpoint of each teledensity band and would obviously imply a target rate which is much higher than that for either of the other two alternatives. The median value is shown in Table 2 in addition to the target rates.

The main difficulty with using the median value is that it would mean abandoning the concept of "best practice" in that half the countries / territories have already achieved the target. Furthermore, even for those countries which are in the top half of each band, the rate of reduction needed to reach the band would be minimal. For instance, for countries / territories in the lowest teledensity band, the median value would be 0.487 SDR. This is only marginally below the target rate already set in ITU-T Recommendation D.140 of 0.5 SDR to be achieved by the end of 1998. If established as a target rate, it would imply that a reduction of less than 1 per cent per year would be necessary to achieved the target rate, compared with the 12 per cent per year which has been achieved over the last three years. For this reason, the use of the median value was rejected in favour of using the average of the lowest 20 per cent of values in each teledensity band.

## Data availability

A third issue which needs to be resolved is what data should be used for the analysis. The research presented in the second revision of the Chairman's Working Document used teledensity data valid for 1 January 1997. Most countries have now reported their data for 1 January 1998, so this is used in Table 2.

With regard to settlement rate data, there was less consensus in the plenary meeting as to which data should be used. Some favoured using the latest available (i.e., data valid on 6th November 1998 when the contribution to ITU-T Study Group 3 is due to be finalised); others preferred to use data which corresponds to the same date as that for teledensity (i.e., 1 January 1998). All countries that have submitted data thus far to the Focus Group have submitted latest available data and it has proved difficult to obtain earlier data. For that reason, the data shown in Table 2 uses data of various dates with a cut-off of 28th September 1998.

A further issue to be resolved is whether to use only published settlement rates (which implies data from the United States/FCC, from the United Kingdom/OFTEL and from Telecom New Zealand) or also data submitted to the Focus Group by other countries. At the request of the plenary meeting, a questionnaire was sent to Focus Group members soliciting additional data. Up to 28th September, some ten Administrations/ROAs had responded (Canada (Teleglobe), Cuba, France Telecom, Ghana, HKTI, Jamaica, Mexico, Nepal, Tonga, Trinidad & Tobago). In some cases this new data reveals lowest rates which are lower than those to New Zealand, UK or USA. For instance, Ghana's lowest rate is with Italy while Trinidad & Tobago's lowest rate is with Venezuela. This new data has been incorporated into the analysis.

The major change which has occurred in the dataset has come from the use of more recent published data for the FCC, OFTEL and Telecom New Zealand. The FCC publishes data on a monthly basis on its website at: http://www.fcc.gov/ib/td/pf/account.html. Data valid for 1 September 1998 was used in the analysis here. OFTEL has also recently published a new survey of accounting rate and transit data which is published on its website at: http://www.oftel.gov.uk/feedback/tiar998.htm. OFTEL's data is valid for July 1998. For Telecom New Zealand, rates are made available on a quarterly basis. The data analysed here date from 30 June 1998. The overall effect of using more recent data is that the target rates are proposed in Table 2 are actually *lower*, for most bands, than those proposed in the second revision of the Chairman's Working Document. This is despite the fact that seven categories have been used instead of six and that the average of the lowest 20 per cent has been used instead of the average of the lowest five. This shows that settlement rates are coming down at a much faster rate than in the past, and the fact of using data which is even a few months more recent has a big impact on the outcome of the model.

## Small island states

As noted above, it may be necessary to use alternatives to teledensity in order to address the concerns of specific groups of countries / territories which may be particularly vulnerable to changes in the international accounting rate system. This was highlighted in the country case studies by Samoa which, even though it is an LDC, has a relatively high teledensity of 5.06. Of all the countries studied, Samoa was considered to be the most vulnerable because it had the highest level of dependence on net settlement payments as a percentage of total telecommunications revenue (above 40 per cent).

**Table 3: Characteristics of small island states**
*For definition of small island states, see the text*

| *Administration* | *Teledensity* | *Main lines (000), 1998* | *Population (000), 1998* | *Income Group* | *Lowest Accounting rate (SDR per minute)* | *To* |
|---|---|---|---|---|---|---|
| Ascension | 37.37 | 0.44 | 1.18 | Small Country | 1 SDR | U.K |
| Niue | 25.00 | 0.50 | 2.00 | Small Country | *0.9 SDR* | U.K |
| Falkland (Malvinas) Is. | 76.50 | 1.53 | 2.00 | Small Country | *1 SDR* | N.Z |
| Tokelau | n.a. | n.a. | 2.00 | Small Country | n.a. | n.a. |
| St. Helena | 29.83 | 1.79 | 6.00 | Small Country | 1.3 SDR | U.K |
| Anguilla | 55.20 | 4.42 | 8.00 | Small Country | 0.681 SDR (91¢) | U.S |
| Tuvalu | 5.04 | 0.50 | 10.00 | Small Country | n.a. | n.a. |
| Nauru | 20.00 | 2.20 | 11.00 | Small Country | 0.9 SDR | N.Z |
| Montserrat | 43.02 | 4.73 | 11.00 | Small Country | 0.606 SDR | U.S |
| Wallis and Futuna | 9.72 | 1.46 | 15.00 | Small Country | 1.2 SDR | N.Z |
| Turks & Caicos | 27.01 | 4.05 | 15.00 | Small Country | 0.606 SDR (81 ¢) | U.S |
| British Virgin Island | 50.63 | 9.62 | 19.00 | Small Country | 0.606 SDR (81 ¢) | U.S |
| Cook Islands | 24.77 | 5.10 | 20.20 | Small Country | 0.774 SDR | N.Z |
| Cayman Islands | 60.66 | 19.41 | 32.00 | Small Country | 0.606 SDR (81 ¢) | U.S |
| St. Kitts and Nevis | 38.16 | 15.60 | 40.00 | Upper-mid | 0.606 SDR (81 ¢) | U.S |
| Northern Marianas | 42.81 | 21.00 | 50.00 | High | 0.82 SDR | |
| Marshall Islands | 5.92 | 3.40 | 60.00 | Lower-mid | 0.898 SDR | N.Z |
| Dominica | 25.23 | 18.70 | 70.00 | Lower-mid | 0.606 SDR (81 ¢) | U.S |
| Antigua & Barbuda | 40.81 | 28.00 | 70.00 | Upper-mid | 0.78 SDR | U.K |
| Kiribati | 2.57 | 2.00 | 80.00 | LDC | *0.9 SDR ($1.20)* | N.Z |
| Seychelles | 19.6 | 14.90 | 80.00 | Upper-mid | 1.123 SDR ($ 1.5) | U.S |
| Tonga | 7.90 | 7.80 | 100.00 | Lower-mid | 0.8 SDR | N.Z |
| Mayotte | 8.97 | 9.30 | 100.00 | Upper-mid | 0.49 SDR (66¢) | U.S |
| Grenada | 26.10 | 26.50 | 100.00 | Lower-mid | 0.606 SDR (81 ¢) | U.S |
| St. Vincent | 17.9 | 20.50 | 110.00 | Lower-mid | 0.606 SDR (81 ¢) | U.S |
| Micronesia | *7.56* | 8.20 | 130.00 | Lower-mid | 0.749 SDR ($1) | U.S |
| S. Tomé & Principe | 1.97 | 2.50 | 140.00 | LDC | 1.13 SDR | U.K |
| St. Lucia | 25.39 | 37.00 | 140.00 | Upper-mid | 0.606 SDR (81 ¢) | U.S |
| Vanuatu | 2.57 | 4.50 | 170.00 | LDC | 0.600 | N.Z |
| Samoa | 5.06 | 8.50 | 170.00 | LDC | 0.6 SDR | N.Z |
| New Caledonia | 24.58 | 47.50 | 190.00 | High | *0.6 SDR* | N.Z |

Source: Telecommunication data from ITU World Telecommunication Indicators Database. Settlement rate data from Focus Group study.

As part of the follow-up work to the case study project, the ITU Asia-Pacific Regional Office has carried out a further four mini case-studies of Pacific Islands, covering Cook Islands, Federated States of Micronesia, Marshall Islands and Vanuatu. These studies use the TAS cost methodology. They confirm that small island states are likely to be among the most vulnerable to changes in the international telecommunications environment. These studies also show that the island states are at the top end of the cost spectrum, having costs for terminating international traffic which range between 50 cents to US$1.00 per minute. These costs are, in some cases, even higher than the TAS benchmarks. The results will be presented in a future contribution to the Focus Group.

It may be worth considering whether to create a separate category for small island states, with population of less than, say 200’000 inhabitants, which are small in size (unlike, say Greenland), distant from a continental mainland (unlike, say Gibraltar), are not passed by cable routes (unlike, say Guam), and which are therefore dependent on satellite communications to provide international service but have only a small

traffic demand to justify the necessary investment. Table 3 shows a list of 31 possible candidates that would fit in this category. Their total population size is below 2 million and their average teledensity is around 17, which would put them in the 10-20 teledensity band, for which the proposed target rate is 0.162 SDR. However, the average of the lowest 20 per cent for this particular group of countries is 0.29 SDR.

If a special category were created to accommodate the special case of small islands states, there may well be claims on behalf of other types of geographically disadvantaged groups of countries for similar special treatment. Thus it may set an unfortunate precedent. There may be other ways of handling the case of small island states, for instance by providing for an extended transition trajectory. Members of the Focus Group are invited to submit additional contributions on this issue.

## Conclusions, and next steps

The purpose of this methodological note has been to explore some of the statistical questions associated with the categorisation of countries / territories for the purposes of establishing target rates for the transition towards cost-oriented settlement rates. The note has explored, in some detail, several of the issues discussed at the second plenary meeting of the Focus Group, namely with regard to the choice of teledensity as the main indicator, the number of bands, the definition of bands, the establishment of target rates within each band, and availability of data. It has also addressed the special case of small island states which may be viewed as being treated unfairly in the proposed methodology.

The note proposes a new set of bands and target rates, in Table 2. It also presents, in an Annex, three alternative scenarios which were considered but rejected for various reasons. The new proposals are open to discussion and comment between Focus Group participants. The intention is to include a new set of proposals in the next (third) revision of the Chairman's Working Document, due to be published on 16th October 1998. There will then be time for a further round of comments before the final contribution is submitted to ITU-T Study Group 3 of 6th November 1998.

Annex: Alternative scenarios.

**Alternative Scenario 1: Summary of settlement rate levels for different teledensity groups ( 8 categories, 20 % lowest)**

*Settlement rate data is expressed in SDRs per minute. Teledensity (T = Telephone lines per 100 inhabitants) is valid for 1 January 1998.*

| | Group A | Group B | Group C | Group D | Group E | Group F | Group G | Group H |
|---|---|---|---|---|---|---|---|---|
| Definition | Teledensity<br>T ≤ 1 | Teledensity<br>1 < T ≤ 5 | Teledensity<br>5 < T ≤ 10 | Teledensity<br>10 < T ≤ 20 | Teledensity<br>20 < T ≤ 30 | Teledensity<br>30 < T ≤ 40 | Teledensity<br>40 < T ≤ 50 | Teledensity<br>T > 50 |
| No. of countries | 42 | 31 | 33 | 30 | 20 | 17 | 19 | 32 |
| Average settlement rate | 0.519 | 0.437 | 0.390 | 0.358 | 0.321 | 0.232 | 0.181 | 0.144 |
| Median settlement rate | 0.487 | 0.400 | 0.375 | 0.317 | 0.303 | 0.200 | 0.122 | 0.097 |
| Lowest settlement rate | 0.250 | 0.150 | 0.160 | 0.150 | 0.110 | 0.100 | 0.060 | 0.02 |
| Country / Territory | Ghana | Albania | Tunisia | Libya | Hungary | Puerto Rico | Belgium | France |
| Average, lowest 20 % settlement rate **(Target rates)** | **0.317** | **0.247** | **0.210** | **0.162** | **0.149** | **0.108** | **0.082** | **0.04** |
| Countries / Territories | Ghana,<br>DPR Congo,<br>Angola<br>Lesotho,<br>Uganda,<br>Malawi,<br>Liberia,<br>Benin | Albania,<br>Algeria,<br>Bhutan,<br>Guatemala,<br>Zimbabwe,<br>Solomon Islands, | Tunisia,<br>Bosnia,<br>Mexico,<br>Azerbaijan,<br>Mayotte,<br>Morocco,<br>Brazil | Libya,<br>TFYR Macedonia,<br>South Africa,<br>Poland,<br>Yugoslavia, FR,<br>Romania | Hungary,<br>Slovak Republic,<br>Lithuania,<br>Turkey | Puerto Rico<br>Slovenia,<br>Czech Republic, | Belgium,<br>Italy,<br>Guam,<br>Ireland | France,<br>Netherlands,<br>United States,<br>Sweden (average)<br>Norway,<br>Switzerland |
| Highest Country / Territory | 1.307<br>Afghanistan | 0.815<br>DPR Korea | 0.65<br>Syria | 0.735<br>Iran | 0.65<br>St-Helena | 0.5<br>Ascension | 0.41<br>Northern Marianas | 0.5<br>Falklands (Malvinas) |
| Standard deviation | 0.198 | 0.162 | 0.138 | 0.171 | 0.143 | 0.109 | 0.112 | 0.118 |

Notes: Target rates are based on the average of the lowest 20 per cent of published settlement rates in each category available at 28 September 98. Each country / territory is treated as single data item. Where there are multiple operators the average is taken.

**Alternative Scenario 2: Summary of settlement rate levels for different teledensity groups ( 38 countries in each of 6 categories, 20 % lowest)**

*Settlement rate data is expressed in SDRs per minute. Teledensity (T = Telephone lines per 100 inhabitants) is valid for 1 January 1998.*

| | Group A | Group B | Group C | Group D | Group E | Group F |
|---|---|---|---|---|---|---|
| Definition | Teledensity<br>T ≤ 0.84 | Teledensity<br>0.84 < T ≤ 5.06 | Teledensity<br>5.06 < T ≤ 13.52 | Teledensity<br>13.52 < T ≤ 26.10 | Teledensity<br>26.10 < T ≤ 48.57 | Teledensity<br>48.57 < T ≤ 99 |
| No. of countries/ territories | 38 | 38 | 38 | 38 | 38 | 34 |
| Average settlement rate | 0.528 | 0.428 | 0.395 | 0.334 | 0.222 | 0.142 |
| Median settlement rate | 0.493 | 0.400 | 0.387 | 0.303 | 0.200 | 0.100 |
| Lowest settlement rate | 0.250 | 0.150 | 0.150 | 0.110 | 0.060 | 0.020 |
| Country / Territory | Ghana | Albania | Libya | Hungary | Belgium | France |
| Average of lowest 20 % settlement rate (**Target Rates**) | **0.330** | **0.254** | **0.191** | **0.158** | **0.091** | **0.041** |
| Countries / Territories | Ghana,<br>DPR Congo,<br>Angola,<br>Uganda,<br>Malawi,<br>Liberia,<br>Benin,<br>Mali | Albania,<br>Algeria,<br>Morocco,<br>Bhutan,<br>Guatemala,<br>Lesotho,<br>Zimbabwe,<br>Solomon Islands | Libya,<br>South Africa,<br>Tunisia,<br>Bosnia,<br>Mexico,<br>Azerbaijan,<br>Mayotte,<br>Brazil | Hungary,<br>Slovak Republic,<br>TFYR Macedonia,<br>Poland,<br>Yugoslavia, FR,<br>Romania,<br>Moldova,<br>Ukraine | Belgium,<br>Italy,<br>Guam,<br>Ireland,<br>Puerto Rico,<br>Slovenia,<br>Spain,<br>Andorra | France,<br>Netherlands,<br>United States,<br>Sweden,<br>Norway,<br>Switzerland,<br>Germany |
| Highest Country | 1.307<br>Afghanistan | 0.815<br>D.P.R Korea | 0.735<br>Iran | 0.655<br>Surinam | 0.650<br>St. Helena | 0.5<br>Falklands |
| Standard deviation | 0.201 | 0.156 | 0.151 | 0.149 | 0.129 | 0.114 |

Notes: Target rates are based on the average of the lowest 20 per cent of published settlement rates in each category available at 28 September 98. Each country / territory is treated as single data item. Where there are multiple operators the average is taken.

**Alternative Scenario 3: Summary of settlement rate levels for different teledensity groups ( 8 categories, 5 lowest)**

*Settlement rate data is expressed in SDRs per minute. Teledensity (T = Telephone lines per 100 inhabitants) is valid for 1 January 1998.*

| | *Group A* | *Group B* | *Group C* | *Group D* | *Group E* | *Group F* | *Group G* | *Group H* |
|---|---|---|---|---|---|---|---|---|
| Definition | Teledensity<br>T ≤ 1 | Teledensity<br>1 < T ≤ 5 | Teledensity<br>5 < T ≤ 10 | Teledensity<br>10 < T ≤ 20 | Teledensity<br>20 < T ≤ 30 | Teledensity<br>30 <T≤ 40 | Teledensity<br>40 <T≤ 50 | Teledensity<br>T > 50 |
| No. of countries/ Territories | 42 | 31 | 33 | 30 | 20 | 17 | 19 | 32 |
| Average settlement rate | 0.519 | 0.437 | 0.390 | 0.358 | 0.321 | 0.232 | 0.181 | 0.144 |
| Median Settlement rate | 0.487 | 0.400 | 0.375 | 0.317 | 0.303 | 0.200 | 0.122 | 0.097 |
| Lowest settlement rate | 0.250 | 0.150 | 0.160 | 0.150 | 0.110 | 0.100 | 0.060 | 0.02 |
| Country (PTO) | Ghana | Albania | Tunisia | Libya | Hungary | Slovenia | Belgium | France |
| Average, lowest 5 countries/ territories | **0.297** | **0.237** | **0.193** | **0.159** | **0.159** | **0.120** | **0.086** | **0.039** |
| Countries / Territories | Ghana<br>DPR Congo,<br>Angola,<br>Lesotho,<br>Uganda | Albania,<br>Algeria,<br>Bhutan,<br>Zimbabwe,<br>Solomon Islands | Tunisia,<br>Bosnia,<br>Mexico,<br>Azerbaijan,<br>Mayotte | Libya,<br>TFYR Macedonia,<br>South Africa,<br>Poland,<br>Yugoslavia, FR | Hungary,<br>Slovak Republic,<br>Lithuania,<br>Turkey,<br>French Guyana | Puerto Rico<br>Slovenia,<br>Czech Republic,<br>Bulgaria,<br>Latvia | Belgium,<br>Italy,<br>Guam,<br>Ireland,<br>Spain | France,<br>Netherlands,<br>United States,<br>Sweden,<br>Norway |
| Highest Country / Territories | 1.307<br>Afghanistan | 0.815<br>DPR Korea | 0.65<br>Syria | 0.735<br>Iran | 0.650<br>St-Helena | 0.500<br>Ascension | 0.410<br>Northern Marianas | 0.500<br>Falklands |
| Standard deviation | 0.198 | 0.162 | 0.138 | 0.171 | 0.143 | 0.109 | 0.112 | 0.118 |

Notes: Target rates are based on the average of the lowest five published settlement rates in each category available at 28 September 98. Each country / territory is treated as single data item. Where there are multiple operators the average is taken.