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Methodology report for the ACCC

# Approach to benchmarking the cost of providing MTAS in Australia

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# Contents

# 1 Introduction

The mobile terminating access service (MTAS) is a wholesale service that is declared under Section 152AL of the Competition and Consumer Act 2010 (CCA) in Australia. MTAS is a service provided by a mobile network operator (MNO) to other MNOs and to fixed network operators to terminate voice calls on the infrastructure operated by that MNO.

The ACCC requires an estimate of the cost of providing MTAS in Australia. The approach chosen for the inquiry requires an international benchmark of the costs of providing the equivalent service in other jurisdictions where calculated using a bottom-up model of hypothetical mobile operators.

The exercise will involve first the selection of an appropriate group of countries from which to obtain benchmark values (implicitly those with available suitable cost models), and second the compilation of a list of appropriate adjustments to the models/benchmark values to reflect the required cost standard and the specificities of providing MTAS in Australia.

The exercise will be undertaken in two phases. In Phase 1, Analysys Mason and the ACCC will develop and finalise the methodology for the benchmark in a document on which the ACCC will hold a consultation (allowing the industry to comment). In Phase 2, the final methodology will be implemented. A draft benchmark will be released to industry parties for consultation, following which the benchmark will be finalised. An overview of the envisioned project timetable is provided in Figure 1.1.

*Figure 1.1: Overview of indicative project timetable [Source: Analysys Mason, 2019]*
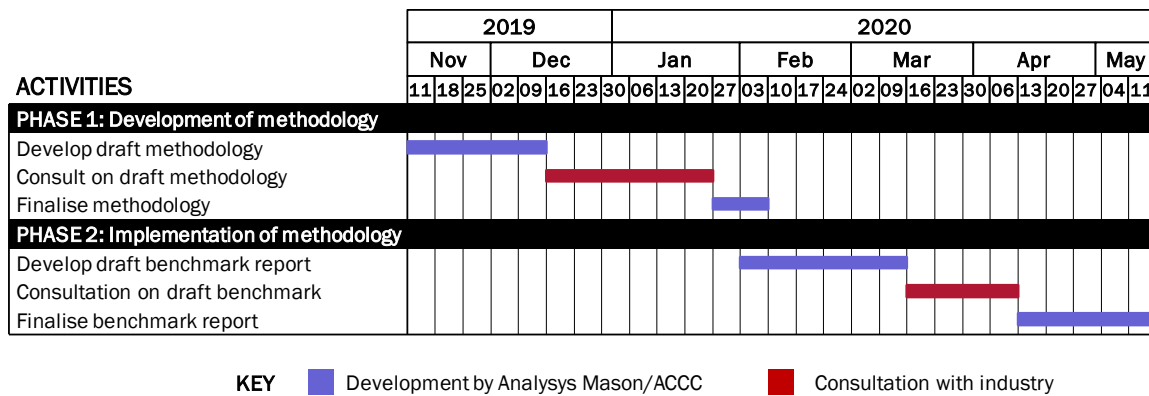


The remainder of this document is laid out as follows:

- Section 2 describes the proposed methodology that Analysys Mason intends to use to develop the cost benchmarks for MTAS
- Annex A provides a series of hyperlinks to the relevant published models proposed for use within the benchmark
- Annex B summarises the data required for the benchmarking exercise.

# 2 Methodology to derive the benchmark cost values

In this section we set out our proposed methodology to derive the benchmark cost value for mobile termination services from a set of published cost models. In particular:

- Section 2.1 lists the candidate published cost models and the subset that we propose to use in the benchmark peer group
- Section 2.2 describes the adjustments that we propose to make to the peer group models and/or the cost results
- Section 2.3 illustrates the implementation of these adjustments for one example model in the proposed peer group (the model published by PTS, the regulator in Sweden).

## 2.1 Candidate cost models

Figure 2.1 below sets out the list of models that Analysys Mason has identified as having been published by national regulatory authorities (NRAs) or similar bodies. The models listed below have all been published with few or no inputs anonymised and therefore closely reflect the cost results that have been used for pricing purposes by the NRA.

*Figure 2.1: Overview of candidate public models for this study [Source: Analysys Mason, 2019]*

| No. | Country | Years modelled | Year of last update | Comments |
|-----|---------|----------------|---------------------|----------|
| 1 | Denmark | 1992–2041 | 2018 | 4G technologies are not modelled |
| 2 | East Caribbean | 2015–2020 | 2017 | |
| 3 | France | 1992–2040 | 2017 | A LR(A)IC+ calculation is not included in the published model |
| 4 | Greece | 1990–2039 | 2019 | The definition of geotypes is not included in the published materials |
| 5 | Mexico | 2005–2056 | 2019 | A LR(A)IC+ calculation is not included in the published model |
| 6 | Netherlands | 2004–2053 | 2016 | |
| 7 | Norway | 1992–2041 | 2017 | 4G technologies are not modelled |
| 8 | Peru | Single-year | 2018 | |
| 9 | Portugal | 2001–2060 | 2015 | |
| 10 | Romania | 2006–2020 | 2013 | 4G technologies are not modelled and the model is no longer published on the NRA website |
| 11 | Spain | 2000–2049 | 2016 | |
| 12 | Sweden | 2008–2058 | 2016 | |
| 13 | UK | 1990–2040 | 2018 | |

There are other examples of published models, such as that recently published by the European Commission, or published by the regulator in Bulgaria, where the model is public but the inputs

have been heavily anonymised. Such models are not suitable for this benchmark, since the model itself as published is not reflective of any specific country or operator.

Of the models shown above, we propose to exclude the three models that do not consider the costs of 4G technologies (Denmark, Norway and Romania), given that 4G is a relevant and efficient technology in widespread use in Australia today. We also propose to exclude the model developed in Greece given that the definition of the geotypes in the model is not available and therefore our proposed approach to capturing the effects of the different geography of Australia (described in Section 2.2.3) cannot be undertaken.

The models for France and Mexico are the only two cases in Figure 2.1 where no LRAIC+ calculation is implemented. We will therefore construct our own estimates of LRAIC+ for these models. In the case of the model for Mexico, we believe we can use calculations implemented in an earlier version of the model.[1] In the case of the model for France, we propose to use the LRAIC+ calculation structure from a similar cost model within the peer group.[2] The inclusion of these LRAIC+ calculations will enable both models to provide LRAIC+ outputs for MTAS. The proposed input adjustments set out in Section 2.2 will still need to be undertaken for both models.

Each of the nine entries that we propose to include in the benchmark (i.e. excluding models 1, 4, 7 and 10 in the table above) will be included in the benchmark set only if it is possible to obtain any necessary permissions from the appropriate parties for this use by the ACCC prior to the consultation on the draft benchmark in early 2020.

## 2.2 Proposed adjustments to make to the models and cost results

Our approach to deriving the benchmarks is to adjust key inputs within each model to more closely reflect the conditions of mobile network deployments and services in Australia. These adjustments are as follows:

- levels of market demand
- assumed market share
- geography
- cell coverage radii
- mobile radio technologies in use
- spectrum holdings
- spectrum costs
- weighted-average cost of capital (WACC)
- currency.

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[1]    Available at http://www.ift.org.mx/politica-regulatoria/condiciones-tecnicas-minimas-y-modelo-de-costos-utilizado-para-determinar-las-tarifas-de

[2]    For example, the previous version of the cost model developed for the regulator in Mexico, published at http://www.ift.org.mx/politica-regulatoria/condiciones-tecnicas-minimas-y-modelo-de-costos-utilizado-para-determinar-las-tarifas-de, includes a LRAIC+ calculation.

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Each is described in more detail in this section in turn.

### 2.2.1 Levels of market demand

The levels of demand for mobile services (by which we mean traffic and subscribers) vary from country to country. Most cost models of mobile networks contain a time series of demand volumes by service for the duration of the modelling period. This time series will usually reflect the market totals, with the modelled operator serving an assumed "market share" of the demand (as described in the next section, 2.2.2). The time series will usually be based on actual information up to the "current" year (likely varying for the published models depending on when they were finalised) and a forecast of traffic and subscriber evolution for future years to the end of the modelling period.

Analysys Mason will develop such a time series of total market demand volumes for Australia, including the relevant forecasts. The forecasts will be developed to 2060, which is the last year modelled by any of the peer group models (Portugal). The forecast will be finalised in the implementation phase. Analysys Mason will request historical information from the MNOs and from the ACCC and will develop the required time series based on the information made available.

Our standard approach to demand forecasting is to derive metrics for historical years that can be forecast (e.g. mobile penetration, outgoing voice minutes per subscriber per month, etc.) and then to develop forecasts for these metrics over a specific number of years. For example we will calculate mobile SIM penetration as a percentage of population in past years, forecast this penetration and then multiply by a forecast of population (for example, from the Australian Bureau of Statistics). This will allow us to arrive at a forecast of mobile SIMs. Other measures would be forecast in a similar fashion.

The information considered to be necessary to developing suitable forecasts for all the models (which each have their own variants of modelled demand services) in the peer group is set out in Annex B.

### 2.2.2 Assumed market share of demand

In the benchmark models, the assumed market share determines the proportion of total market demand (traffic and subscribers) that is assumed to be carried by the modelled network. Therefore, this is invariably a "network-level" market share rather than a "retail-level" market share.

On the basis that there are three network operators with extensive mobile network coverage (all at least 97% of the population[3]) in Australia, we propose to assume a network market share of 33.3% to use in all of the benchmark models.

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[3]    See https://www.accc.gov.au/system/files/Communications%20Sector%20Market%20Study%20Final%20Report%20April%202018_0.pdf, page 35

### 2.2.3 Geography

A key input to a cost model of mobile networks is the way in which areas with different geo-demographic characteristics are handled in the country (areas are commonly grouped into one of a number of classes of area with "similar" geo-demographics, referred to as 'geotypes'). Each of the benchmark models has a classification for the country in question, based on a specific definition (usually using population density).

Geotypes are often defined based on a set of sub-regions of the country, ordered by population density. Such a definition was applied in the model developed by Analysys Mason for ACMA, based on approximately 2200 Statistical local areas level 2 (SA2).[4] We propose to use these areas as the starting point for the geotypes in each of the benchmark models. We will then apply the geotype definition (e.g. the population density boundaries) for the geotypes in each benchmark model to the SA2 areas.

Therefore, for each of the benchmark models, we propose to maintain the geotype definitions (e.g. in terms of population density ranges within a geotype) but to estimate the different fractions of the population and area within each of these geotypes if representing Australia. We will classify Australian areas using a single national geo-demographic dataset (i.e. a tiling of Australian land) into each of the geotype definition.

This will allow the Australian land area to be captured in the model and will cause a significant increase in the number of sites modelled (since the modelled network must now cover a large proportion of the Australian land mass, rather than the land area of the country in question).

The most rural geotype in each benchmark model will effectively be a 'catch-all' category i.e. all areas below a certain population density.

It is known that using too large an aggregated area scale for geotyping can lead to anomalous results because it will miss the impact of localised areas of higher density. Mobile coverage is planned at the scale of coverage of individual base stations, so smaller towns in rural areas may in some cases be small "islands" of mobile coverage. Other models will have made different choices of modelled areas ('geotypes') based on different sources of geographical data with different typical area scales (postal codes, municipalities, census divisions, counties, etc).

There is a more granular (level 1, 'SA1') set of areas that are also available from the Australian Bureau of Statistics (ABS).[5] However, we believe that the SA2 areas are an appropriate choice for the geotype definition since their scale is more appropriate to the coverage of individual base stations. This is illustrated in Figure 2.2 below for the Adelaide area.

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[4]    See the GEO worksheet of the Excel file (the 'mobile network infrastructure forecasting model') available at
       https://www.acma.gov.au/publications/2015-06/report/mobile-network-infrastructure-forecasting-model.

[5]    See https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.001July%202011

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*Figure 2.2: Illustration of SA1/SA2 areas for the Adelaide region [Source: Analysys Mason/ABS, 2019]*
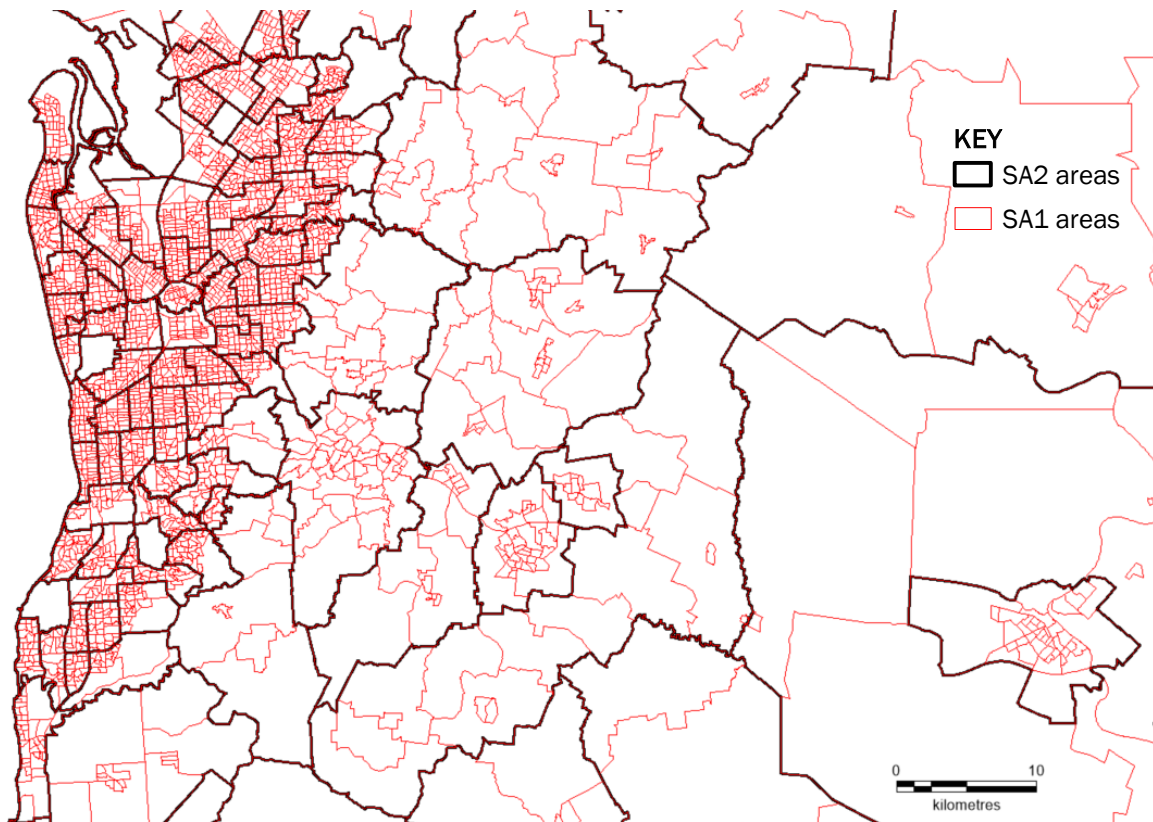


As can be seen above, the SA2 areas illustrated in the Adelaide area are usually several kilometres wide, whilst many SA1 areas are much less than 1km wide. Base stations will therefore implicitly cover many SA1 areas (which could be assigned to different geotypes), whilst several base stations will be required to cover SA2 areas. Since base stations and sites are calculated separately by geotype in the benchmark models, the SA2 areas therefore appear more appropriate (and also consistent with the approach taken to geography in the modelling by ACMA).

### 2.2.4 Cell coverage radii

One issue of our proposed approach to capturing geography is that the assumed cell radius in the most rural geotype (a key input to the mobile network design that will determine the number of rural sites required) will have been set in each of the benchmark models based on calibration to the coverage that exists in the most rural areas covered within that country.

The benchmark models usually calculate the number of base stations required in a given geotype to both provide the necessary coverage and provide the necessary busy-hour traffic capacity, and then take the larger of the two. The number of base stations required for coverage in a particular geotype is usually calculated as:

$$\frac{\textit{Area assumed to be covered in that geotype}}{\textit{Area covered by a typical base station in that geotype}}$$

If the area assumed to be covered in a geotype is large when using the Australian areas, the benchmark models will (to first order) respond in the required way. The change to the cell radius will also account for second-order effects e.g. Australian networks might tolerate worse performance at the cell edge.

The most rural geotype in a benchmark model is effectively defined with no lower bound of population density, but the actual least population density in the modelled geotype could still vary significantly. For example, the areas with the lowest population density in the Dutch model will still likely have a far higher population density than most of the SA2 areas in Australia. The real network design does respond to this actual population density: the towers used in the Netherlands' most rural areas may be shorter than in the remote areas of Australia, for example.

Since Australia is likely to have coverage in far more sparse areas than these other models, the calculation will likely overestimate the number of coverage sites required when Australian geo-demographic information is used in the benchmark models.

We therefore propose to adjust (i.e. increase) the cell radii assumed for mobile coverage in the most rural geotype in each of the benchmark models to address this issue. This adjustment would need to be made for each spectrum band used. We note that the model published by ACMA assumes a cell radii by band in the modelled rural and remote geotypes (14km and 22km for 900MHz coverage in the two geotypes respectively), which provide useful starting points for this adjustment.[6]

Equivalently, we could also adjust the radius for the most urban geotype, given that the population density in that geotype does not have an upper bound. However, we believe that this will not be necessary since the site deployment in the most urban geotype in all the selected benchmark countries will be traffic driven rather than coverage driven i.e. the coverage cell radius in this geotype will not affect the total number of sites deployed since this will likely be determined solely by the traffic loading.

### 2.2.5 Mobile radio technologies in use

As can be seen in Figure 2.1, the benchmark models consider a mixed deployment of 2G, 3G and 4G technologies. However, in Australia, 2G technologies have been completely shut down since 2019, meaning that only 3G and 4G technologies are relevant to the forward-looking costs of mobile termination in Australia.

Therefore, in each benchmark model, any modelled 2G network will be assumed to be switched off from 2019 onwards (or reduced to a negligible deployment[7]) and all traffic will be assumed to be

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6    See rows 314 and 315 of the *IN* worksheet of ACMA's mobile network infrastructure forecasting model, as published on its website.

7    It may be that the benchmark models return formula errors if the 2G network is completely switched off, in which case a negligible network, such as 1 site per geotype, will be kept running.

carried on 3G or 4G technologies from 2019 onwards. Therefore, all 2G-related network costs will be assumed to be recovered before 2019.

We will request the proportion of traffic carried on each network technology (2G, 3G and 4G), as described in Annex B. Based on the historical information received, we will forecast the proportion of traffic on 3G and 4G networks for future years.

In terms of assumed coverage, the exact level of area coverage assumed in the benchmark models will be determined during the implementation, but we would expect it to be within the range of area coverage deployed by actual operators in Australia (as requested in Annex B). If insufficient data is provided, then Analysys Mason will make its own assumptions in the implementation phase.

### 2.2.6 Spectrum holdings

Since the benchmark models largely consider only frequency division duplex (FDD) bands rather than time division duplex (TDD) bands, TDD spectrum will not be considered in this benchmark. We consider this to be a reasonable simplification since TDD technologies are not in widespread use in Australia for the conveyance of mobile voice traffic.

Another simplification that is required for this exercise is the assumption of nationwide licences. Many of the benchmark models cannot assume regional spectrum allocations, which are in place for several bands in Australia. Therefore, a conservative (i.e. smaller) assumption of nationwide spectrum holdings in each band will be assumed in each of the benchmark models. The impact of the modelled operator having smaller spectrum holdings will be more pronounced for traffic-driven geotypes (usually the more urban geotypes), where more sites will need to be deployed to serve the assumed traffic.

The bands of spectrum that will be considered and the assumed nationwide allocation for the modelled operator are summarised in Figure 2.3 below. The year shown is derived from the first year in which the spectrum licence is active.[8]

*Figure 2.3: Spectrum bands to be considered in the calculation [Source: Analysys Mason, 2019]*

| Band | Spectrum frequencies (MHz) | Proposed use in models | Spectrum allocation (MHz) | First year available |
|------|----------------------------|------------------------|---------------------------|----------------------|
| 700MHz | 703-748 paired with 758-803 | 4G coverage | 2×10 | 2014 |
| 800MHz/ 900MHz | 825–845 paired with 870–890[9] and 890–915 paired with 935–960 | 3G coverage (previously 2G coverage) | 2×10 | Beginning of model[10] |

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8     This information can be found at https://www.acma.gov.au/spectrum-auctions

9     Based on the reports published at https://www.acma.gov.au/consultations/2019-08/800-900-mhz-band-implementation-arrangements-support-milestone-1-consultation-212018

10    This spectrum will be assumed to be available for 2G deployments in the early modelled years, if required.

| Band | Spectrum frequencies (MHz) | Proposed use in models | Spectrum allocation (MHz) | First year available |
|---|---|---|---|---|
| 1800MHz | 1710–1785 paired with 1805–1880 | 4G capacity (previously 2G capacity) | 2×15 | 2000 |
| 2100MHz | 1920–1980 paired with 2110–2170 | 3G coverage | 2×10 | 2002 |
| 2.5GHz | 2500–2570 paired with 2620–2690 | 4G capacity | 2×20 | 2014 |

The assumed spectrum holdings will be tested as part of the benchmarking exercise to determine how sensitive the cost results are to these assumptions. This will also have a knock-on effect on the contribution from our approach to capturing spectrum costs, as described in Section 2.2.7 below.

### 2.2.7 Spectrum costs

We believe that the simplest approach to considering spectrum costs is to de-activate spectrum costs within all the models and consider Australian-specific spectrum costs externally to the models as an additional cost component. This is because the structure of spectrum costs varies from country to country, with different relative mixes of one-off auction fees and recurring fees in each case.

We therefore propose to start with the spectrum auction fees and recurring fees in Australia, based on the actual licence durations. The costs will be allocated across a time series of traffic volumes using a routeing factor approach. The resulting spectrum cost per minute can then be added to the benchmark MTAS values, which exclude spectrum costs.

This cost allocation will be applied using an economic depreciation calculation implemented in a simple side model. Spectrum costs will be allocated to the traffic of the network technologies that use the spectrum (for example, if a spectrum band is assumed to be used for only 3G traffic, then it will be allocated only to 3G traffic).

Our approach will be to calculate spectrum costs for the modelled operator based on the assumed spectrum holdings in Figure 2.3. These will be derived as separate time series of one-off fees to be capitalised (e.g. auction payments and renewal fees) and recurring opex.

We will then allocate these costs to the assumed traffic of the modelled operator, based on the demand forecasts developed according to Section 2.2.1. Only the auction fees for active spectrum licences will be considered, with costs recovered by their expiry date (i.e. the auction fees for licences that have expired in or before 2019 will be assumed to already be fully recovered).

This approach averts the diverse nature of spectrum costs in other countries and will automatically reflect the specifics of Australia's spectrum costs in the estimate of the costs of MTAS.

For the one-off fees to be capitalised, we will use the information on ACMA's website. Where fee information (e.g. annual fees) is not publicly available, we will request the information from ACMA.

Our proposed approach to one-off fees by band is summarised below in Figure 2.4.

*Figure 2.4: Assumption of one-off fees by band [Source: Analysys Mason, 2019]*

| Band | Assumption | Source |
|---|---|---|
| 700MHz | Derived from the spectrum auctions of the band in 2017 and 2013, excluding an assumed cost of the 2.5GHz band (see below) | See entry for 2.5GHz band |
| 900MHz | No one-off fees | Reflects situation in Australia |
| 800MHz, 1800MHz and 2100MHz | Renewal fees based on cost per MHz per capita issued by Australian government | Government directive of 2012[11] |
| 2.5GHz | Derived from TPG's spectrum auction payment for a standalone allocation of 2.5GHz spectrum in 2013 | ACMA website[12] |

### 2.2.8 WACC

The benchmark models all require a pre-tax WACC as an input. The ACCC will calculate a pre-tax WACC for this purpose. The ACCC will provide both a real-terms pre-tax WACC and a nominal-terms pre-tax WACC, since different models in the peer group require a different format of WACC input.

### 2.2.9 Currency

The relevant outputs will be the cost per minute for voice termination, for the years 2020–2024. Each of the benchmark models produces results for a given year in local currency; some models express the results in real-terms currency (according to a currency value in a fixed year, which excludes subsequent inflation effects), whilst other models express results in nominal-terms currency (the currency value of the given year).

We will take the cost results from the benchmark models and first convert them to nominal currency (if this is not already undertaken in the model). For each model, we will source forecasts of domestic inflation for the period 2020–2024 from appropriate sources (such as government treasury organisation or bank).

We will also convert the values (i) to Australian dollars using the most recent foreign exchange rates.

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[11]    See https://www.communications.gov.au/sites/default/files/Direction-to-the-ACMA-under-subsection-294-2-of-the-Radiocommunications-Act-1992.pdf, page 2

[12]    See https://www.acma.gov.au/auction-summary-700-mhz-digital-dividendand-25-ghz-band-reallocation-2013 and https://www.acma.gov.au/auction-summary-700-mhz-residual-lots-2017

We also propose to estimate the proportion of costs that relate to non-tradeable items (e.g. site installations, operating expenses)[13] using the asset-by-asset cost breakdowns available in each cost model. For each model, we will then adjust this proportion of the cost result for purchasing power parity (PPP).

The datapoints required for both conversions (foreign exchange rate and PPP) will be sourced from the World Bank.[14]

## 2.3 Worked example for Sweden

As a demonstration of how the adjustments could work, we have investigated how they would be implemented in one model in detail (the model released by the Swedish regulator PTS[15]). Figure 2.5 below summarises the adjustments that we expect would be required.

*Figure 2.5: Indication of adjustments to the Sweden model [Source: Analysys Mason, 2019]*

| Adjustment required | Location in model | Description of adjustment(s) |
|---|---|---|
| Forecasts of total market demand | MarketDemand worksheet | Replace demand forecasts for Sweden with demand forecasts for Australia, covering subscribers, voice minutes, messages and data megabytes. These forecasts will be applied consistently across all the benchmark models and will be based on historical data received from the ACCC and mobile providers (see Annex B) |
| Assumed market share | Inputs_Generic_integrated worksheet, rows 14–17 | Revise to be the assumed share of the total market served by the modelled operator, applied consistently across all the benchmark models |
| Geography | AreaToPop worksheet | Replace input data for Swedish municipalities with Australian SA2 areas. Allocate SA2 areas to the geotypes defined in the model based on population density ("urban" areas have more than 260 people per km²; "rural" areas have fewer than 15.8 people per km²; all areas in between are "suburban") |
| Adjustments to cell radii | NetworkDesignInputs worksheet, cells J15 | Increase the assumed rural cell radii on the basis that the rural areas in Australia, on average, will have a lower population density than in Sweden. In this model, by changing the assumption for the 900MHz band, the assumed radii for the other |

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13    We will assume that electronic capital assets are tradeable and therefore that these capital costs will not require an adjustment for PPP.

14    See https://data.worldbank.org/indicator

15    Available from https://www.pts.se/globalassets/startpage/dokument/ovrigt/kalkylmodell/lric.zip

| Adjustment required | Location in model | Description of adjustment(s) |
|---|---|---|
| | | bands in that geotype update automatically based on assumed ratios |
| Mobile radio technologies | Inputs_Generic_integrated worksheet, rows 32, 69–77 NwDsRadioCov worksheet, rows 36–39 | De-activate the 2G network Leave a negligible 2G coverage network (1 site per geotype) to avoid formula errors |
| Spectrum holdings of MNOs | Inputs_Generic_integrated worksheet, rows 47–97 | Set to an assumed allocation for a hypothetical operator in Australia. These assumed holdings and use by technology will be applied consistently across all the benchmark models Set cell H11 to 1.2[16] on the NetworkDesignInputs worksheet so that the lowest frequency band is appropriate to 700MHz rather than the 450MHz band |
| Remove country-specific spectrum costs | NetworkDesignInputs worksheet, cell range *weighted.MHz.for.licensing.fee* | Set to zero to deactivate spectrum fees within the model |
| WACC | Ctrl worksheet, cell *input.WACC* | Set to an appropriate value for a real-terms, pre-tax weighted-average cost of capital for Australia, which will be applied consistently across all the benchmark models |
| Expressing results in Australian currency | External to the model | Convert the output cost per terminated minute (expressed in 2010 SEK) into nominal SEK and then convert into nominal AUD using an exchange rate. Calculate the contribution from non-tradeable items and adjust for PPP |
| Include Australian-specific spectrum costs | External to the model | Calculate the assumed Australian-specific spectrum costs for the modelled hypothetical operator, allocate them to the traffic carried and add the per-minute contribution to give the final cost result |

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[16]   This adjustment factor for 700MHz spectrum can be found in each of cells IN!J307/IN!R307/IN!Z307 of ACMA's mobile network infrastructure forecasting model, as published on its website.

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# Annex A  Locations of relevant cost models

Figure A.1 below sets out the sources for the cost models Analysys Mason proposes to use in the benchmark.

*Figure A.1: Weblinks to relevant cost models [Source: Analysys Mason, 2019]*

| Country | Webpage |
|---|---|
| Eastern Caribbean | https://www.ectel.int/regulatory-framework/access-and-interconnection |
| France | https://www.arcep.fr/uploads/tx_gspublication/modele-TA-mobile-consultation_publique-avril17.rar |
| Mexico | http://www.ift.org.mx/politica-regulatoria/modelos-de-costos/condiciones_tecnicas_minimas_y_modelos_de_costo_2020 |
| Netherlands | https://www.acm.nl/nl/publicaties/publicatie/16587/ACM-vraagt-om-reacties-op-ontwerpbesluit-vaste-en-mobiele-gespreksafgifte |
| Peru | http://www.osiptel.gob.pe/articulo/res021-2018-cd |
| Portugal | https://www.anacom.pt/render.jsp?contentId=1363106#.VcOBX_mqqko |
| Spain | https://www.cnmc.es/en/ambitos-de-actuacion/telecomunicaciones/concrecion-desarrollo-obligaciones |
| Sweden | https://www.pts.se/sv/bransch/telefoni/konkurrensreglering-smp/prisreglering/kalkylarbete-mobilnat/gallande-prisreglering |
| UK | https://www.ofcom.org.uk/consultations-and-statements/category-1/mobile-call-termination-market-review |

# Annex B   Data required for the benchmarking exercise

In order to modify the input data and parameters in the benchmark models, Analysys Mason will require several datapoints.

These will cover demand volumes, distribution of traffic by radio technology, mobile network area coverage by technology and base station deployments.

The ACCC will request the information set out below from the MNOs for the years requested in Figure B.1, Figure B.2, Figure B.3 and Figure B.4.

## B.1   Demand volumes

Figure B.1 and Figure B.2 below describe the demand volumes that we will require for developing the demand forecasts required for the benchmarking exercise.

For the avoidance of doubt, the volumes required are those carried on each MNO's network (i.e. both retail and wholesale), rather than just the volumes of the MNO's retail subscriber base.

Figure B.1 sets out the high-level total market information that we require for as many years as are available, but if possible for the last 20 years. A long time series of information is required since most of the benchmark models are multi-year models that consider network deployments in the 2000s, or even earlier.

*Figure B.1: High-level demand required for the period 2000–2019 [Source: Analysys Mason, 2019]*

| Data to request | Description |
| --- | --- |
| Subscriptions | Year-end total active mobile SIMs, including mobile broadband and machine-to-machine (M2M) |
| Outgoing voice | Annual mobile-originated minutes |
| Incoming voice | Annual mobile-terminated minutes |
| Messages | Annual mobile-originated SMS/MMS |
| Messages | Annual mobile-terminated SMS/MMS |
| Data megabytes | Annual mobile data megabytes sent and received |

Figure B.2 indicates the more detailed demand volumes that we will require, for which we will only seek data for the last five years. To the extent that this data is not provided by the MNOs, Analysys Mason will have to make its own assumptions when developing forecasts for these more specific services that are considered within the benchmark models.

*Figure B.2: Detailed demand required for the period 2015–2019 [Source: Analysys Mason, 2019]*

| Data to request | Description |
|---|---|
| Subscriptions | Year-end active mobile broadband SIMs, excluding M2M |
| Subscriptions | Year-end active M2M SIMs |
| Outgoing voice | Annual mobile-originated minutes (on-net) |
| Outgoing voice | Annual mobile-originated minutes (off-net to mobile) |
| Outgoing voice | Annual mobile-originated minutes (off-net to fixed) |
| Outgoing voice | Annual mobile-originated minutes (off-net to international) |
| Outgoing voice | Annual mobile-originated minutes (off-net to non-geographic numbers) |
| Outgoing voice | Annual mobile-originated minutes (other off-net) |
| Incoming voice | Annual mobile-terminated minutes (from mobile) |
| Incoming voice | Annual mobile-terminated minutes (from fixed) |
| Incoming voice | Annual mobile-terminated minutes (from international) |
| Incoming voice | Annual mobile-terminated minutes (from other) |
| Outgoing messages | Annual mobile-originated messages (on-net) |
| Outgoing messages | Annual mobile-originated messages (off-net to mobile) |
| Outgoing messages | Annual mobile-originated messages (off-net to international) |
| Outgoing messages | Annual mobile-originated messages (other off-net) |
| Incoming messages | Annual mobile-terminated messages (off-net from mobile) |
| Incoming messages | Annual mobile-terminated messages (from international) |
| Incoming messages | Annual mobile-terminated messages (from other) |
| Data megabytes | Annual data megabytes sent |
| Data megabytes | Annual data megabytes received |

## B.2 Distribution of traffic by radio technology

Analysys Mason will also require the information in Figure B.3 on the distribution of traffic by technology for each of the last ten calendar years (2010–2019). This number of years is required to understand how traffic has migrated between technologies over time (and, in particular, at the recent point of 2G shutdown).

*Figure B.3: Traffic distribution information required for the period 2010–2019 [Source: Analysys Mason, 2019]*

| Description |
|---|
| Proportion of all voice minutes carried on own 2G radio networks |
| Proportion of all voice minutes carried on own 3G radio networks |
| Proportion of all voice minutes carried on own 4G radio networks |
| Proportion of all data megabytes carried on own 2G radio networks |
| Proportion of all data megabytes carried on own 3G radio networks |
| Proportion of all data megabytes carried on own 4G radio networks |

## B.3 Mobile network area coverage

Analysys Mason will require the information in Figure B.4 on the geographical area coverage of each network technology. The signal strength assumed for the coverage value will also need to be provided (dBm).

*Figure B.4: Coverage data required for the period 2015–2019 [Source: Analysys Mason, 2019]*

| Description |
| --- |
| Geographical land area outdoor voice coverage of 2G networks, in square kilometres, year-end |
| Geographical land area outdoor voice coverage of 3G networks, in square kilometres, year-end |
| Geographical land area outdoor voice coverage of 4G networks, in square kilometres, year-end |
| Geographical land area indoor voice coverage of 2G networks, in square kilometres, year-end |
| Geographical land area indoor voice coverage of 3G networks, in square kilometres, year-end |
| Geographical land area indoor voice coverage of 4G networks, in square kilometres, year-end |

## B.4 Base station deployments

Analysys Mason will also require the information in Figure B.5 on site locations, which we understand can be provided by the ACCC. Analysys Mason will use this information to calculate the number of sites by geotype for high-level comparisons with the benchmark models. This calculation will need to be undertaken for each set of geotypes.

*Figure B.5: Radio site locations [Source: Analysys Mason, 2019]*

| Site identifier | Longitude | Latitude | 3G is active (Y/N) | 4G is active (Y/N) |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
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