Forecast of

Residential Main Lines

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Forecast Of Residential Main Lines

LEGEND

T = Total area (the whole city, or a relatively large sub-area)

z = Zone

t = point of time

RES = number of RESidential lines

HH = number of HouseHolds in the area in question

HP = Household Penetration in the area in question
Numerical value: from 0 to -or even above- 1.

HPG = Household Penetration - Global trend
Numerically, HPG ranges from 0 to 1.
Verbally, that corresponds to "Low" → "Average" → "High"

LER = Local Economy Relative to global economy.
Numerically, LER ranges from 0 to 1.
Verbally, that corresponds to "Bad" → "Average" → "Good"

HPCT = Household Penetration Curve Type
HPCT = VL means "Very Low" penetration
HPCT = L means "Low" penetration
HPCT = A means "Average" penetration
HPCT = H means "High" penetration
HPCT = VH means "Very High" penetration

HE = Household Economy in the area in question
HE = 1 means "High Income" families
HE = 2 means "Middle Income" families
HE = 3 means "Lower Income" families
HE = 4 means "Poor" families

'(prime) means "intermediate (temporary) value"

A number of different ways can be used to make the residential lines forecast.

One widely used approach is to forecast each single future extension, aggregating the forecasts from houses to blocks, from blocks to zones, and from zones to exchange areas. One reason for choosing this approach is that the subscriber network must be planned in detail, the objective being short to medium term planning.

The same forecast is then used for long term network planning. This process is based on detailed investigations of each spot of the city, arrived at by visiting these spots, making notations on their present state and on the possible further development of different kinds of buildings in all locations, then comparing those notations with those collected on the previous visit, and finally manually estimating the likely number and kind of new extensions to be installed in the near future.

The process is an extremely time-consuming one and is therefore not very frequently repeated.

The accuracy of the process is reasonably sufficient from block perspective, whereas the accuracy of the process for aggregates is much lower.

For long term planning purposes, we prefer good long term forecasts for each zone covering the network structure from the top level down to, usually, only cabinet or remote subscriber unit level.

To achieve this, an alternative forecast scheme is proposed here.

From Household Penetration (HP) To Number Of Residential Lines (RES)

If we can forecast the number of households (HH) of a certain area, and if we are able to estimate the household penetration (HP), then we can calculate the demand (RES) using the following formula:

$$RES = HH \cdot HP$$

We can increase the accuracy of the forecast by sub-dividing the total number of households into the different economic levels (HE), provided that we can find good estimates of the penetration rates for those different levels. If we distinguish between four classes, HE=1,2,3,4, we obtain:

$$RES_{HE} = HH_{HE} \cdot HP_{HE} \qquad \text{HE=1,2,3,4}$$

and $$RES = \sum_{HE=1}^{4} RES_{HE} = \sum_{HE=1}^{4} HH_{HE} \cdot HP_{HE}$$

Now the following difficulty may arise: For the ***total*** area (T), e.g., the city, it may be possible to forecast the number of households (HH) for each class HE=1,2,3,or 4, but for some or for all of the ***zones***, perhaps only a kind of ***weighted*** value (HE) can be defined, e.g., for a particular zone (z), we estimate $(HE) = 2.5$, corresponding to an ***average*** penetration of the zone $(HP) = 0.45$ (example).

For the total area, we then obtain:

$$RES_{HE}(t) = HH_{HE}(T) \cdot HP_{HE} \qquad \text{HE=1,2,3,4}$$

and $$RES(T) = \sum_{HE=1}^{4} RES_{HE}(T)$$

whereas for a zone, we estimate:

$$RES(z)' = HH(z) \cdot HP(z)$$

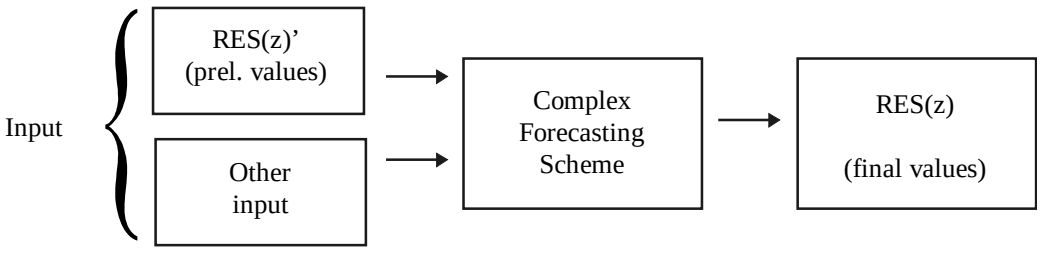
If, however, HH per income level (HE) is known for a certain zone, then for that zone, of course,

$$RES_{HE}(z)' = HH_{HE}(z) \cdot HP_{HE} \qquad \text{HE=1,2,3,4}$$

and $$RES(z)' = \sum_{HE=1}^{4} RES_{HE}(z)'$$

We see that two elements are needed to make this kind of estimate, namely household penetration (HP), and number of households (HH).

In the formulae above, prime (') has been used to indicate a preliminary value since zone forecasts obtained in this way are normally used as an input to a somewhat more complex combination of forecasting methods where zone forecasts are matched against total values and are thus adjusted in the corresponding process:

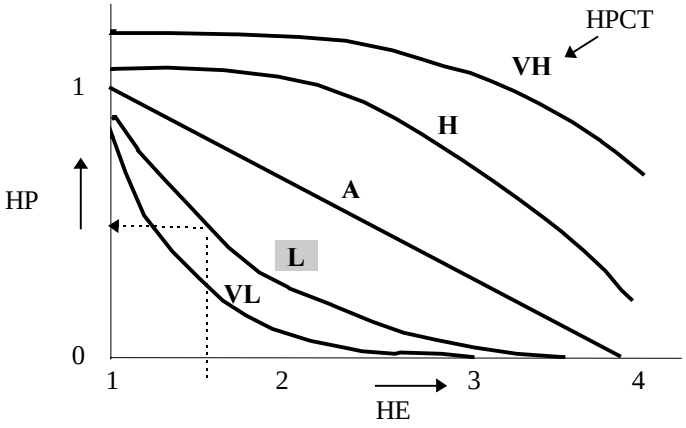


Household Penetration (HP)

Household economy (HE) is only one of several variables that describe household penetration (HP), it is certainly a very important variable. Its relative significance is usually greater in countries where the ***total*** penetration rate is low compared to countries where telecommunications are already well developed. This results from a number of reasons, such as the fact that even relatively poor families in rich countries are better off than their HE level counterparts in poorer countries. And, in addition, telecommunication tariffs are usually much lower in the wealthier countries.

It is possible to graphically represent these conditions such that the curves (HPCT) show household penetration (HP) relative to household economy (HE), each HPCT curve corresponding to the stage of relative economic development combined with the relative household penetration, in the particular area.

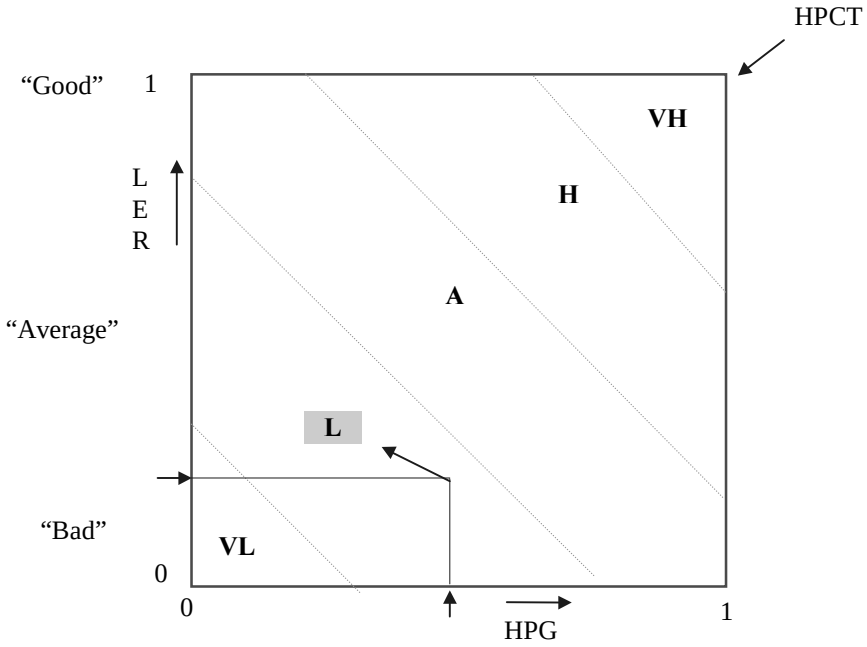
Example : Graphs for determination of penetration



Procedure :

1. *Choose curve HPCT (eg L=Low)*
2. *Enter HE (eg 1.5 = between High Class and Middle Class households)*
3. *Read HP (eg 0.58 = 58% penetration)*

A decision table, as shown below, can be used to choose the curve type (HPCT).



Example : decision table for determination of curve type

"Low"	"Average"	"High"

Procedure : 1. Estimate HPG (eg ≈ 0.5 = "Average")
2. Estimate LER (eg≈ 0.25 = "Bad" to "Average")
3. 3. Entering with HPG and LER, read HPCT (eg L = "Low")

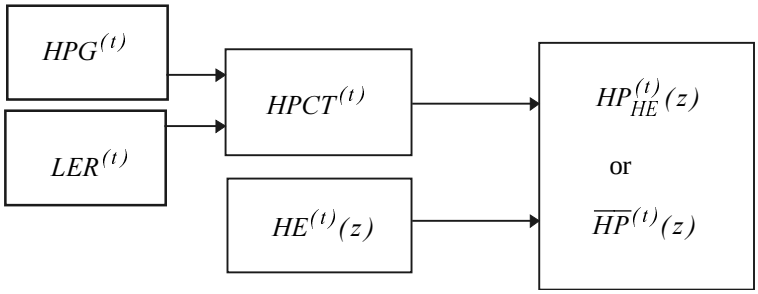
Note that an area under study may correspond, for example, to HPCT=L at the ***present*** (point of) time, but may be expected to increase, e.g., to HPCT=A at a future (point of) time!

LER is defined as "Local Economy Relative to global economy". The terms "Local" and "Global" need to be explained.

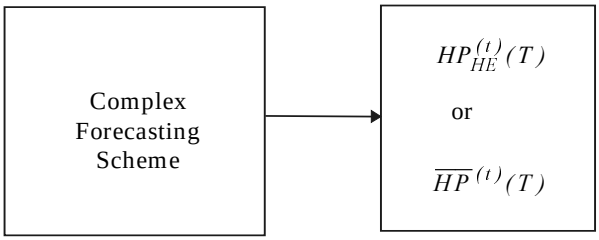
Definition of "Local": If, from a socio-economic point of view, the character of the metropolitan area under study differs significantly from the other cities in that country, then the term "local" applies only to that area under study. If, however, the characters of the cities in any given country are fairly uniform, then "local" can mean all the cities in that country.

Definition of "Global": that part of the world that most significantly influences both the economy and the social development of a particular country.

The method described above can be used for all levels, i.e., zones, traffic areas, and the total area. It is of the most value, however, when applied to investigations per zone.

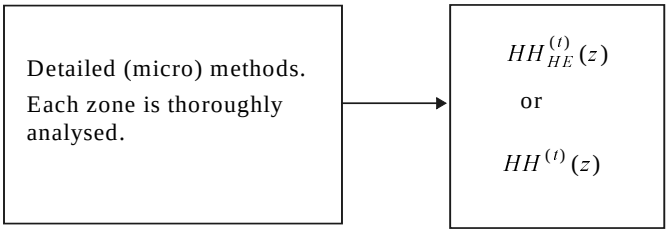


For higher levels (T), complex combinations of methods using several different, important forecasting methods and sources of data should be used.

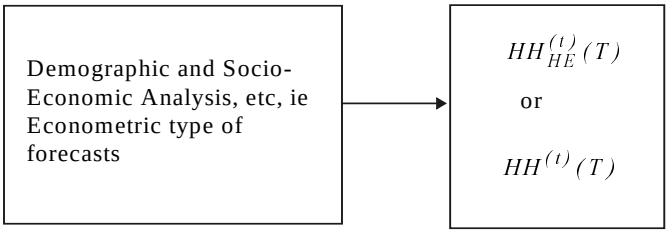


Number Of Households

Two separate forecasts should be made; the first is a forecast per zone, based on detailed (micro) methods, where each zone is analyzed in detail, and, the second is total forecast, where a number of different methods and types of data are combined in a complex combination of methods, using, above all, socio-economic and regression models.



Forecast on the zone level

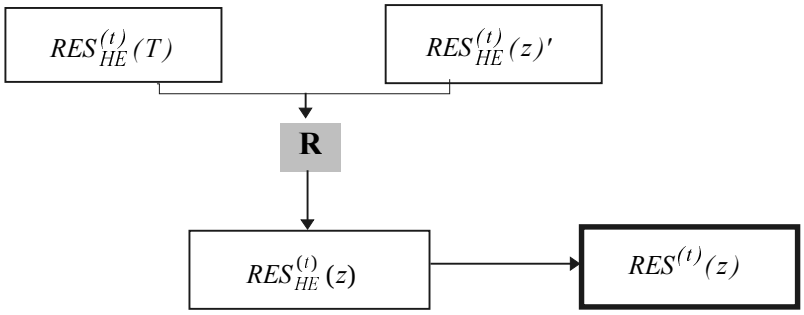


Total forecast

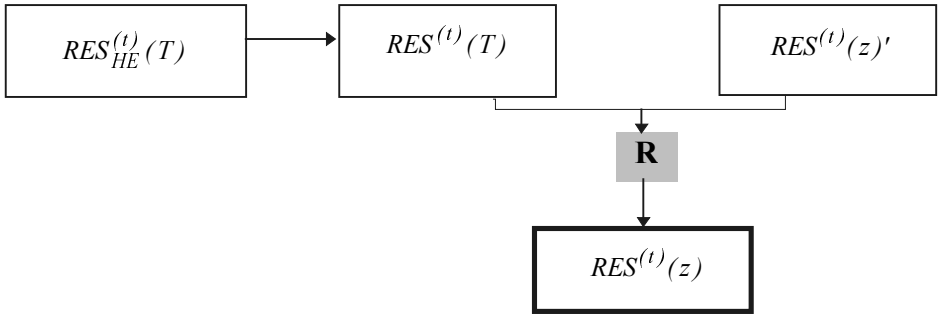
Final Forecast

In order to estimate the future number of residential lines per zone $(RES^{(T)}(z))$, two alternate paths can be used, depending on the supply of available data.

Path 1 :



Path 2 :



R means Reconciliation between total values and zone values. Normally, Totals should be accepted and zone values accordingly adjusted so that the sum of the adjusted values agrees with the Total value.

"Total" may refer to the entire metropolitan area, but if background information so permits, the entire area can be sub-divided into a number of sub-areas where a number of "Totals" must be defined.

In such a case, it may be possible to combine Path 1 and Path 2, e.g., if zone values $RES_{HE}^{(T)}(z)'$ (by household income level) are known for some sub-areas, but only $RES^{(T)}(z)'$ (zone totals) are known for other sub-areas.