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*IT R&D Global Leader*

# Interconnection Regime in Korea : Long Run Incremental Cost Approach

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**I** Interconnection regime and BU Model

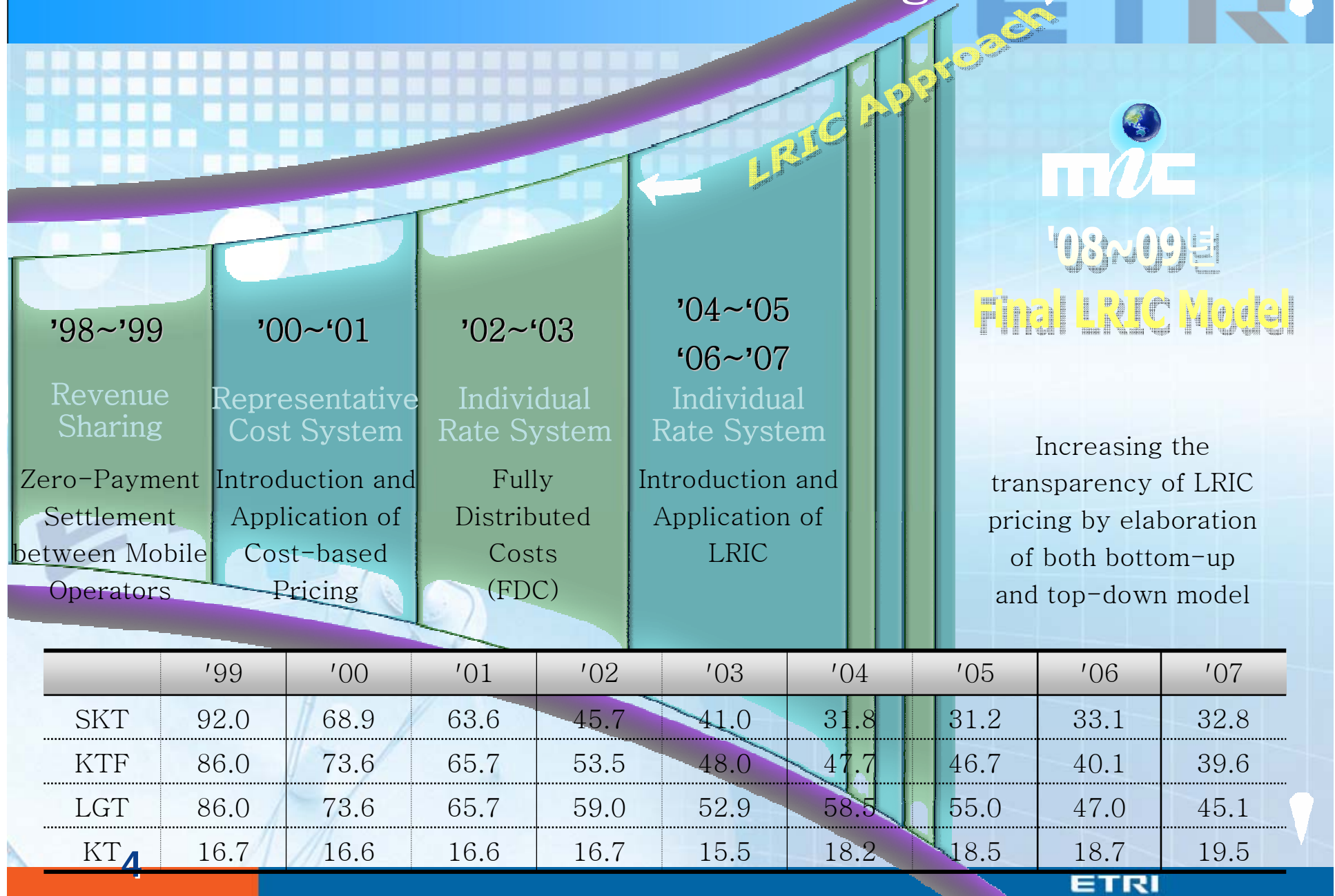
**II** Redesign of Mobile and Fixed Networks

**III** Future Development of BU Model

## I Interconnection regime and BU Model

- I-1. Overview of Interconnection regime in Korea
- I-2. Forward Looking LRIC
- I-3. Bottom-Up & Top-Down
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- I-5. ETRI Bottom-Up Model
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# I-1. Overview of Interconnection regime in Korea



## I-2. Forward Looking LRIC

- ❑ LRIC is a methodology for estimating the cost of a total service increment based on a hypothetical model of the actual network
- ❑ the long-run is defined as the time horizon over which all costs are variable

### The concept of forward-looking

- ❑ Assets are valued using the cost of replacement with the modern equivalent asset
- ❑ The MEA will generally incorporate the latest available and proven technology



## I-3. Bottom-Up & Top-Down

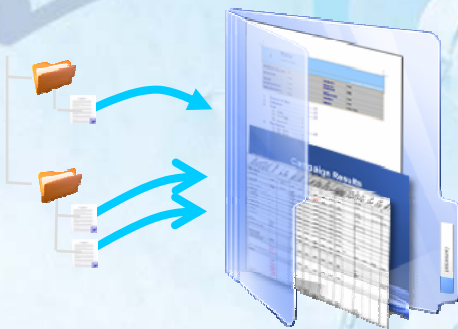
### Bottom-Up Model

- Bottom-up modeling uses detailed data to build a hypothetical network that can supply telecommunications services, including interconnection services. The costs of this network, including capital costs and operations and maintenance costs, are then allocated to all the services provided



### Top-Down Model

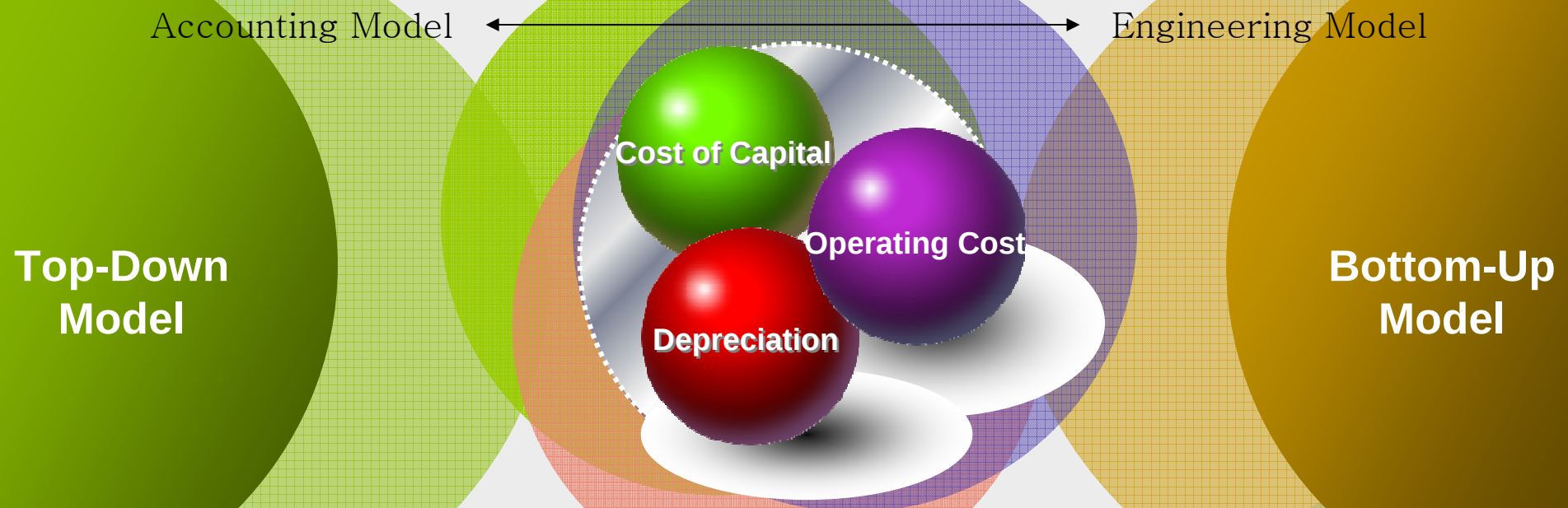
- Top-down modeling attempts to measure LRIC starting from the firm's actual costs, as set out in its accounts. This method does not involve detailed network modeling. Instead, a top-down model separates the firm's assets and costs into service groups, and then adds the costs associated with interconnection to arrive at an estimate of LRIC



## I-4. Overview of LRIC Model in Korea

Since 2004, forward looking LRIC has been adopted as interconnection Pricing methods, because FDC was calculated based on historic costs and therefore it might include the costs of the operator's inefficient investment

### *Long Run Incremental Cost*



Access charges for the years 2006 and 2007 are set in a way that the top-down LRIC of the year 2004 was projected to the years 2006 and 2007 with the trends of bottom-up LRIC during the period 2002-2007

# I-5. ETRI Bottom-Up Model

ETRI

## Bottom-Up Model Process

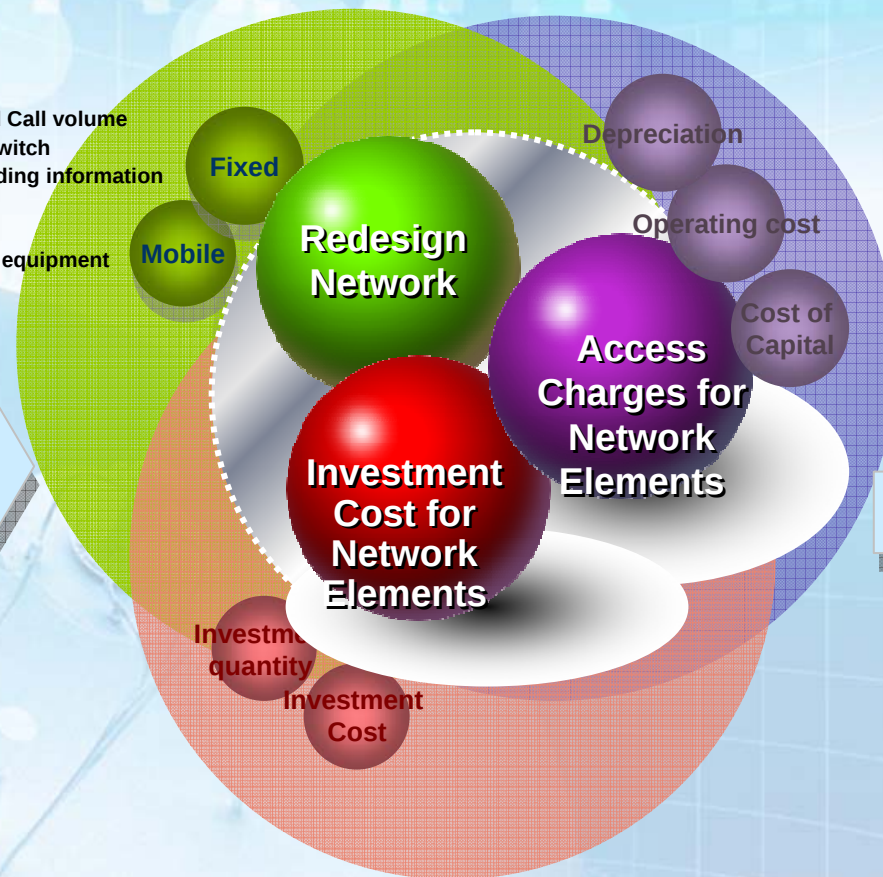
Component and Implementation

### Input Data

- Subscribers' location and Call volume
- Location information of switch
- topography, heights, building information

- Specifications of equipment
- Equipment price

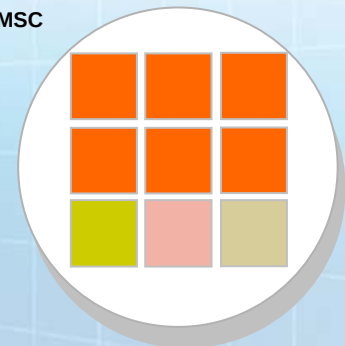
- Asset lifetime
- Operating cost
- Conversion factor
- Cost of capital



### Results

- Interconnection tariff for fixed and mobile operators
- Interconnection tariff for network elements

- KT : Local loop, Local Exchange, LE-LE, LE-TE, Toll Exchange, TE-TE
- SKT/KTF/LGT : Base station, Control station, MSC, CGS, HLR, BS-MSC, MSC-MSC

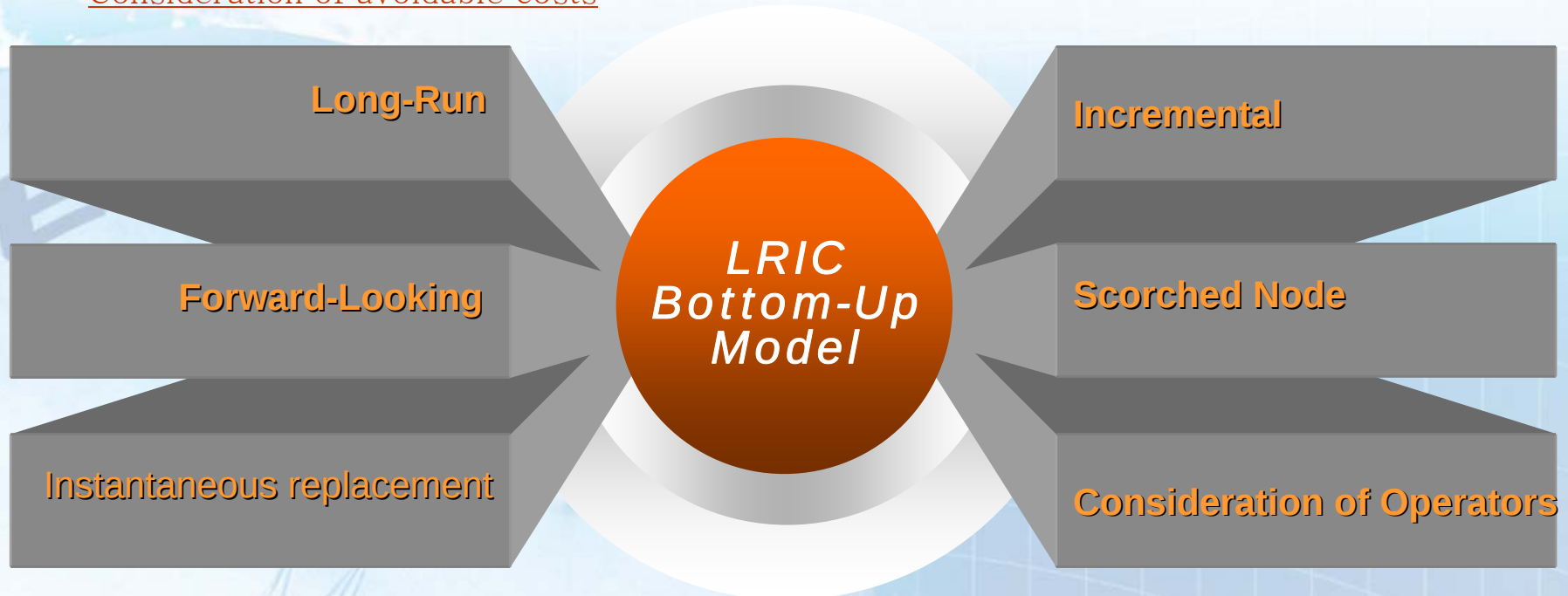


## I-6. Principles and Assumptions of ETRI BU Model

Bottom-Up Model estimates the cost of a total service increment based on a hypothetical model of the network that is more economical and efficient than the actual network

❑ Building an LRIC BU model was carried out under the following three principles;

1) Design of efficient network topology, 2) Adoption of forward-looking technology, 3)  
Consideration of avoidable costs



# I-7. Overview of Bottom-Up Model Development

'08~'09

- Extension of sample area
  - Mobile 16, Fixed 20
- Elaboration of algorithms for optimizing mobile and fixed networks
- Re-design of 3G network

'06~'07

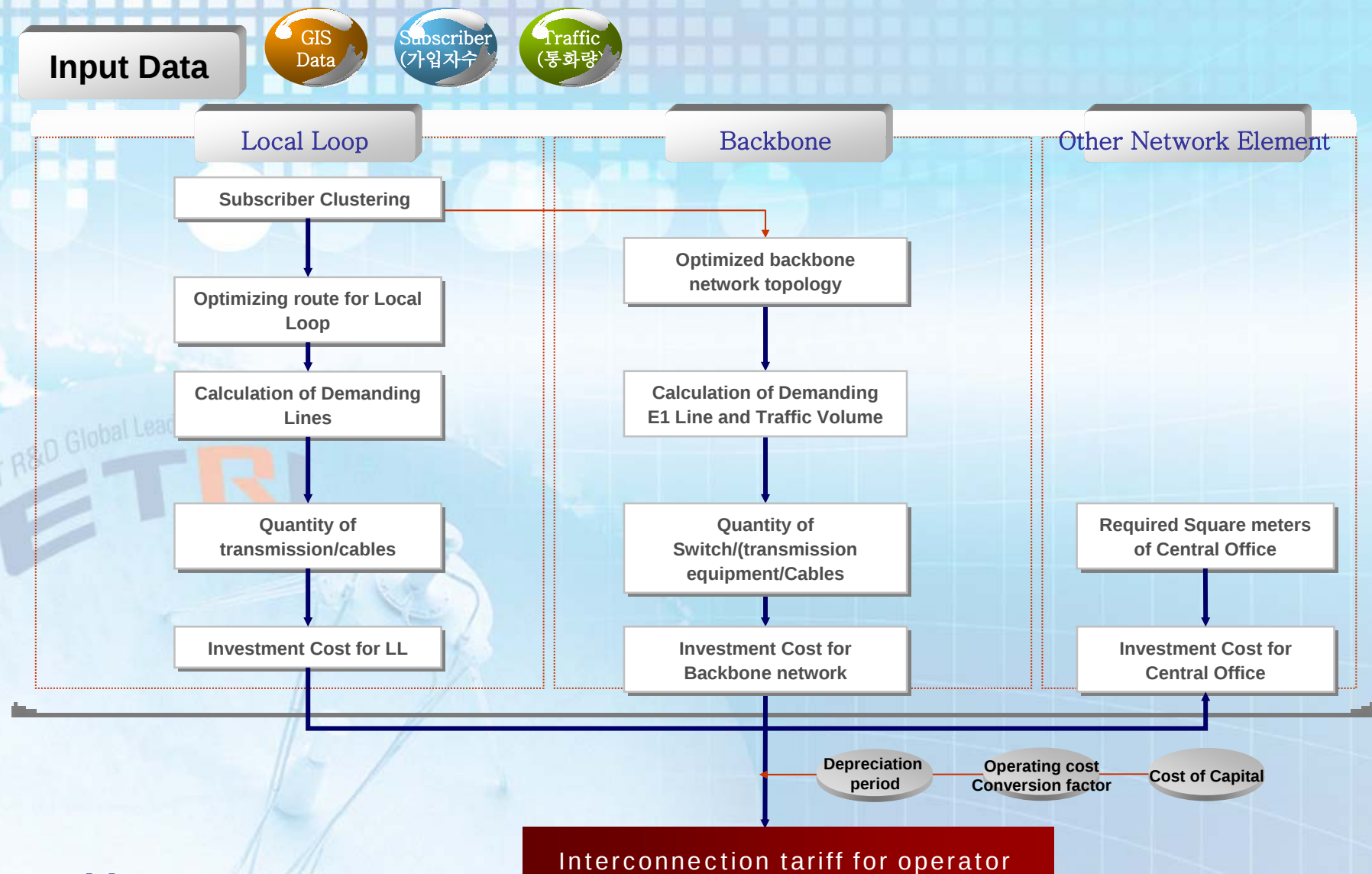
- Extension of sample area
  - Mobile 8, Fixed 12
- Full redesign of backbone network
- Allow Operator's existing Point of Interconnection
- Forward-looking Technology

'04~'05

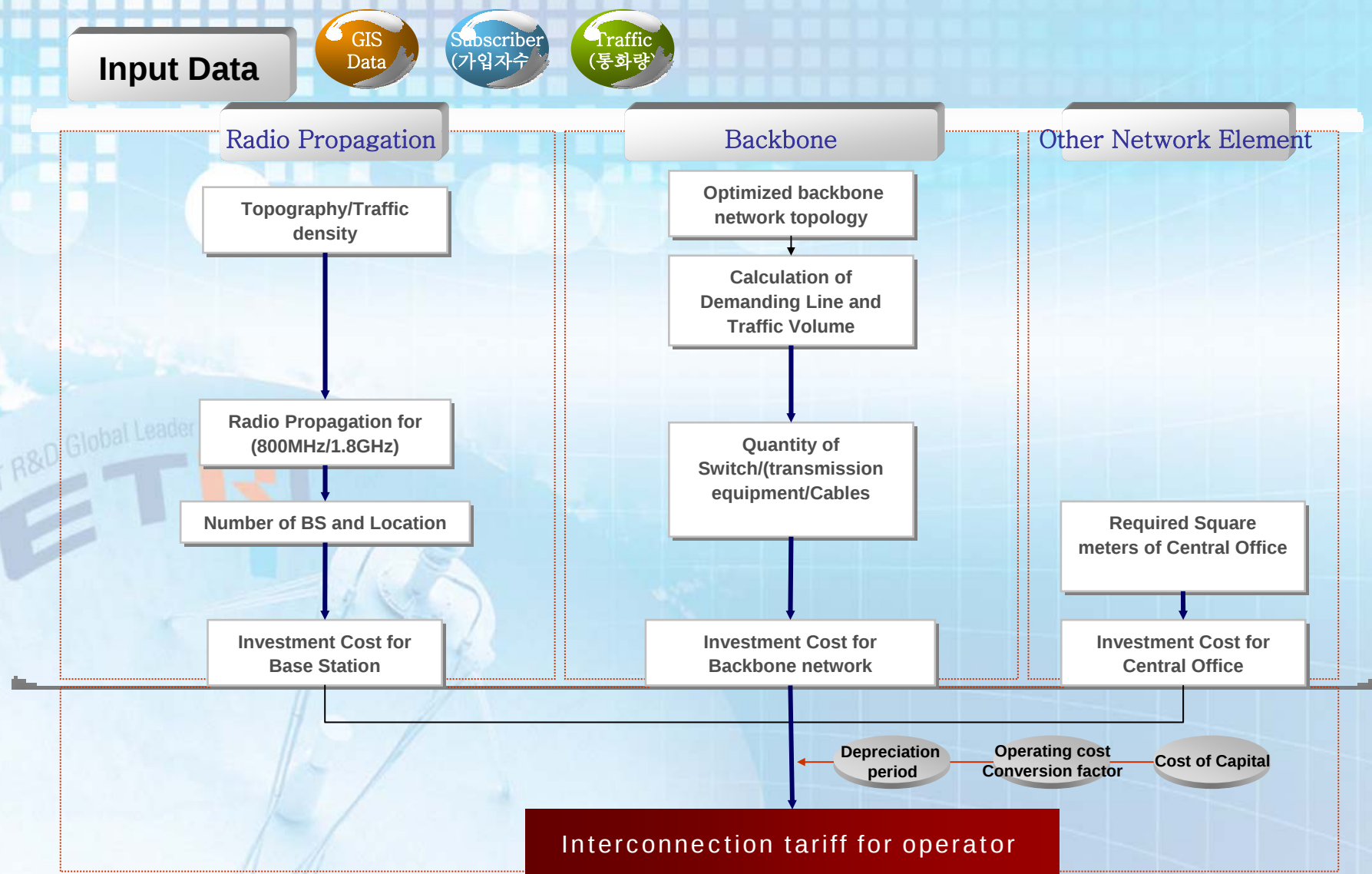
- Sample area :
  - Mobile 2, Fixed 12
- Partial redesign of backbone network
- Reflect Operator's network topology

Upgrade BU Model

## I-8. LRIC –Bottom-Up Process : Fixed Network



# I-9. LRIC –Bottom-Up Process : Mobile Network



## I-10. Radio Propagation Model for Redesigning BTS

The radio propagation model employed is “ $L_{\text{vpm}}$ (Vertical Plane Model)” which is a combination of knife edge model, Walfisch model, and dual slope model



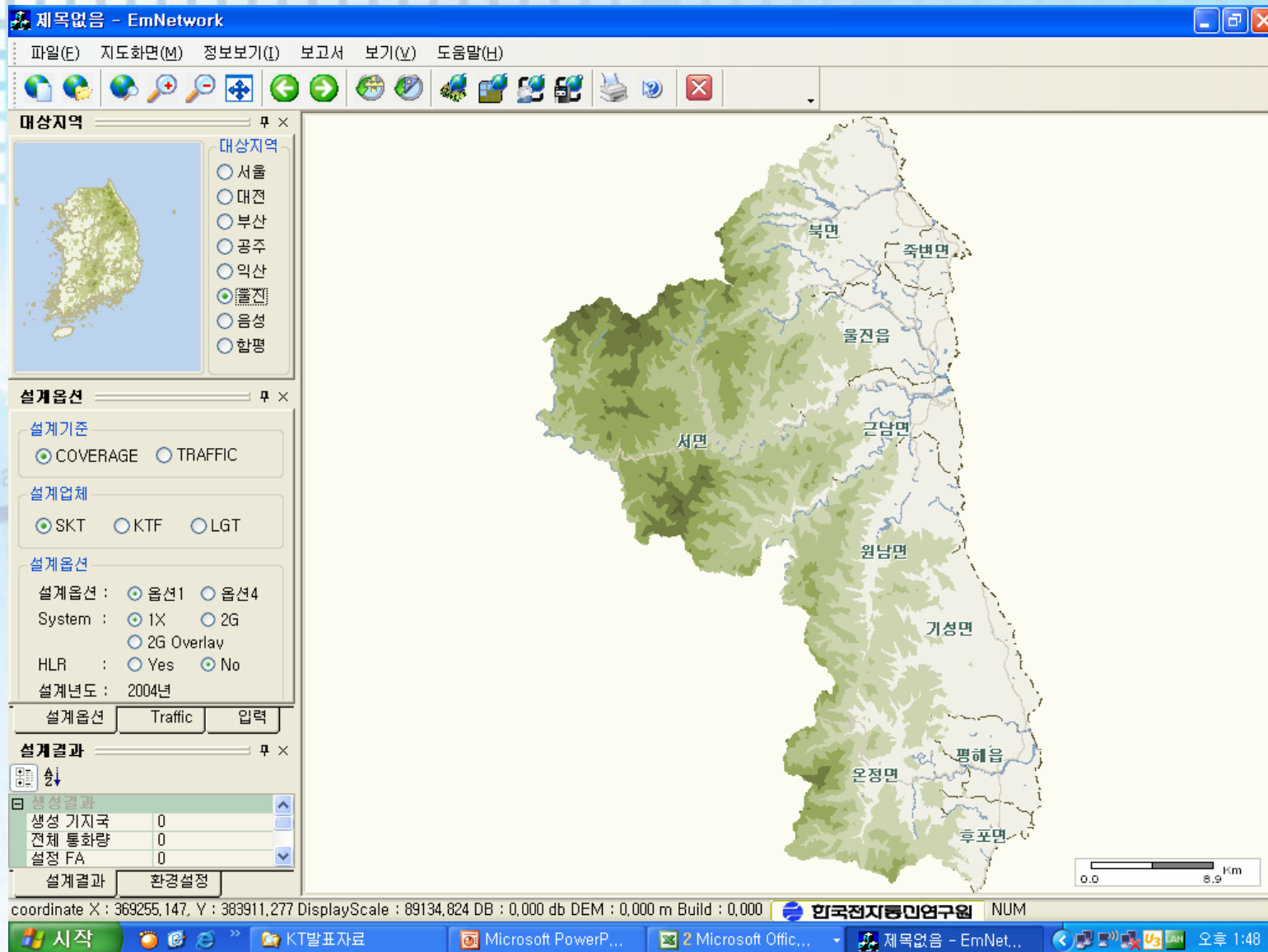
$$L_{\text{vpm}} = (1-g)[\text{Max}(L_{\text{FS}}, L_{\text{DS}}) - F] + gL_{\text{W}}$$

- $g$  = Weighting Factor
- $L_{\text{FS}}$  = Free Space Loss
- $L_{\text{DS}}$  = Dual Slope model
- $F$  = Knife Edge model
- $L_{\text{W}}$  = Cost231 Walfisch-Ikegami model

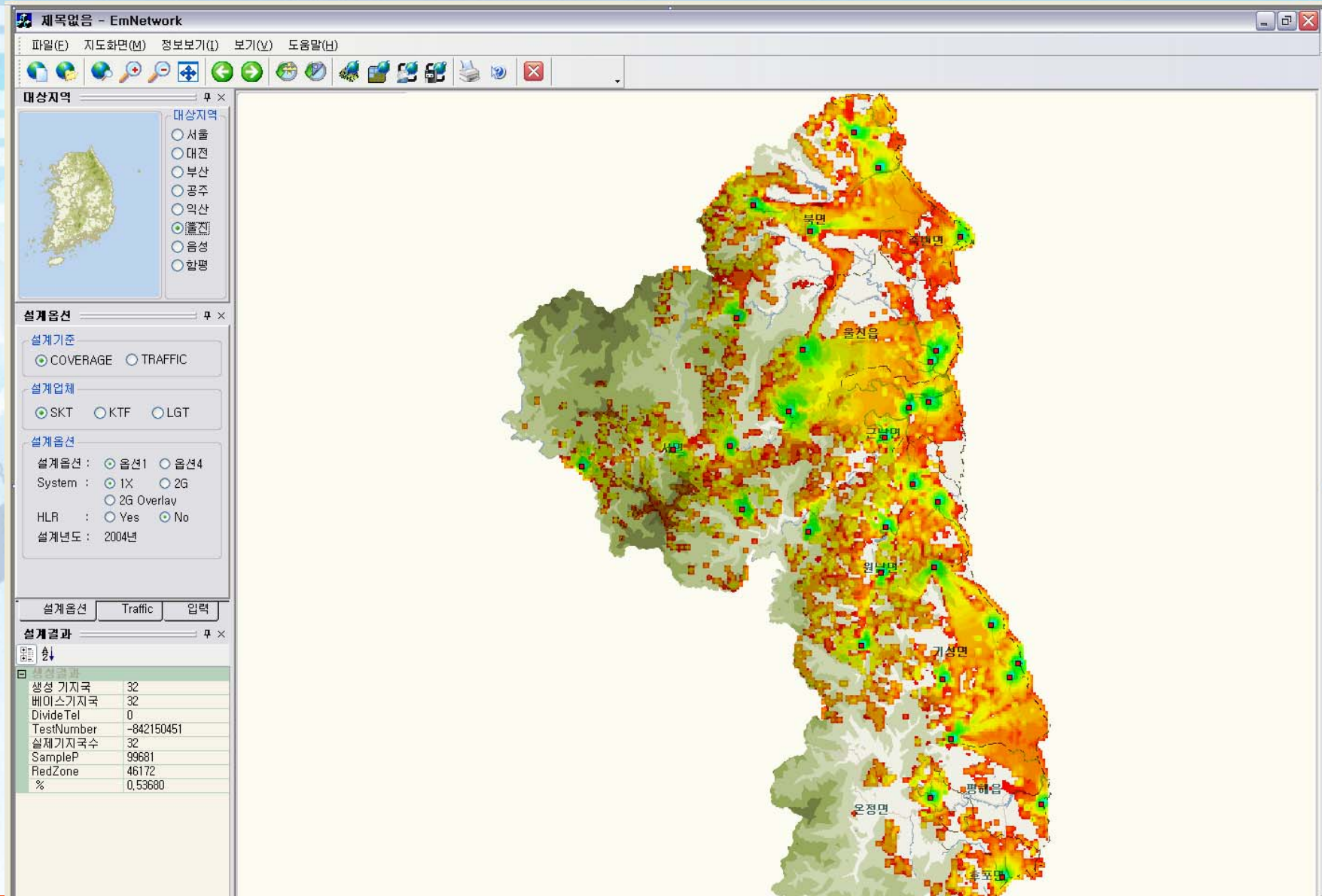
## II Redesign of Mobile and Fixed Networks

- II-1. Redesign of Mobile Network – GIS Data
- II-2. Radio Propagation Simulation with Current BTS
- II-3. Results of Redesigning BTS
- II-4. Results of Redesigning Network – Sample Area
- II-5. Redesign of Fixed Network – Demonstrations

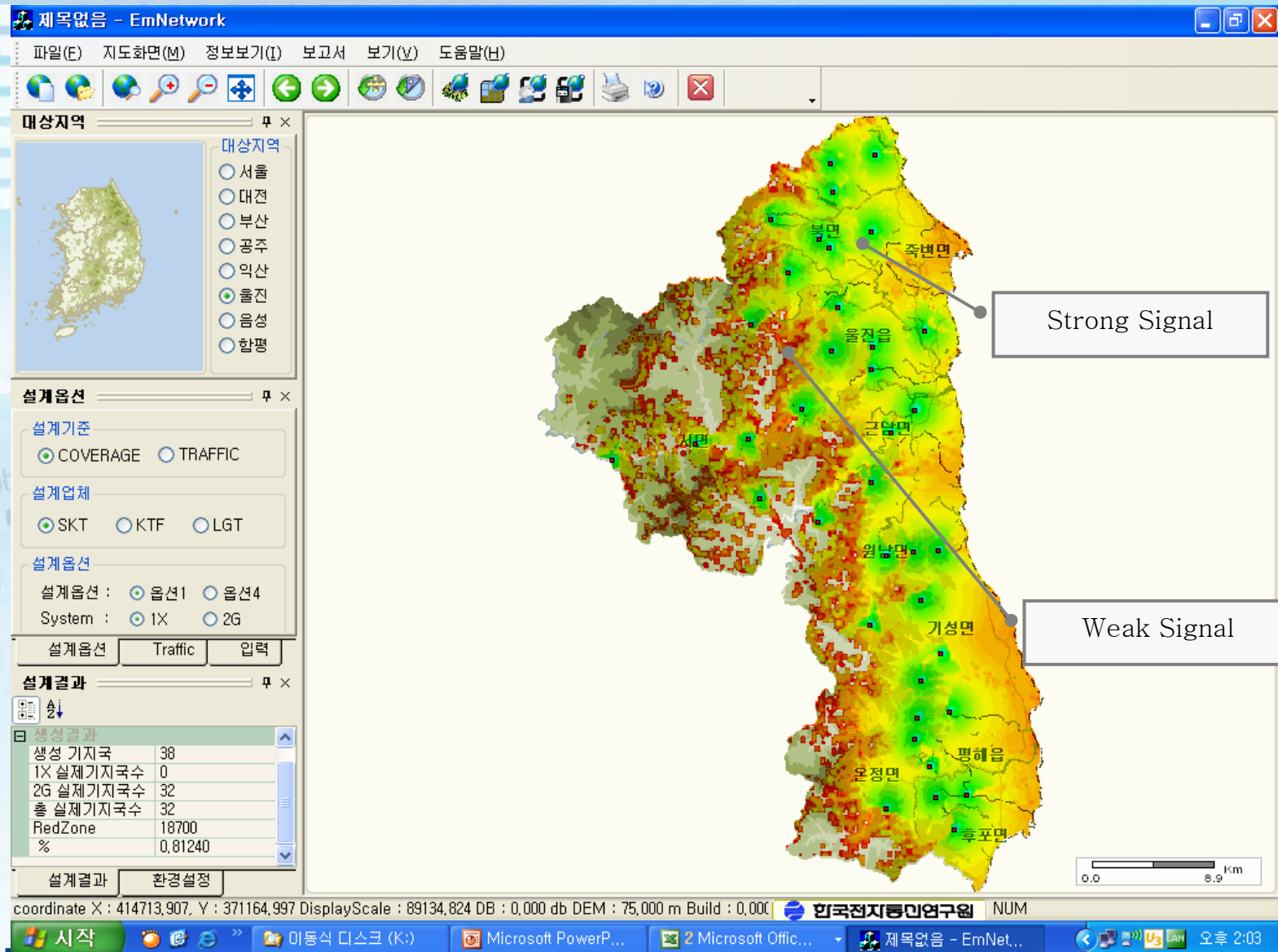
## II-1. Redesign of Mobile Network – GIS Data



## II-2. Radio Propagation Simulation with Current BTS

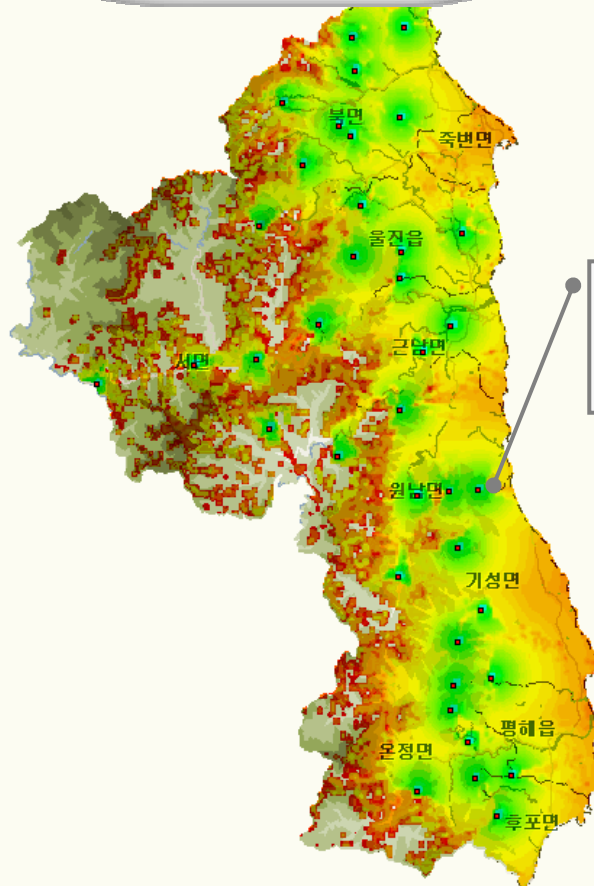


## II-3. Results of Redesigning BTS

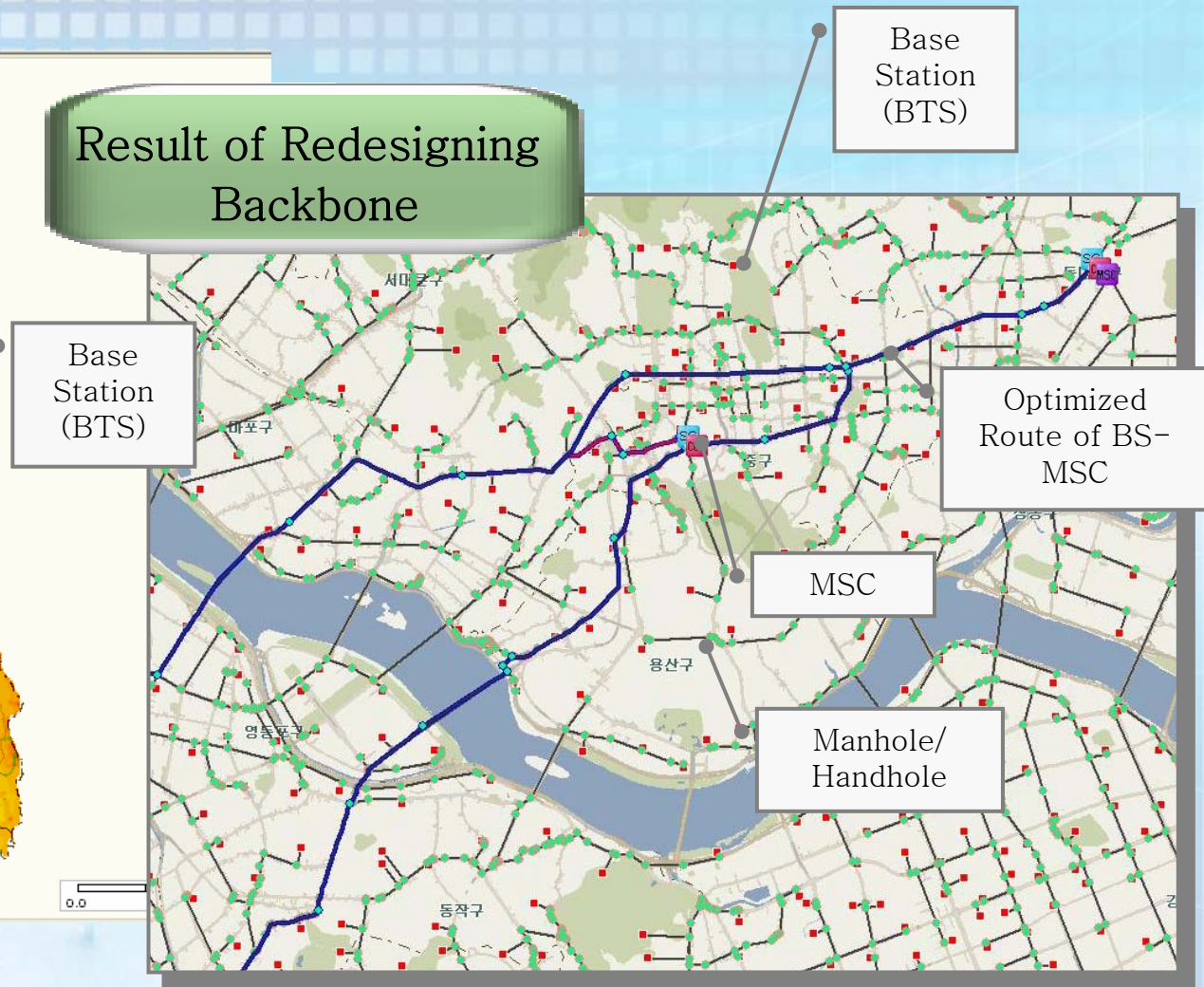


## II-4. Results of Redesigning Network – Sample Area

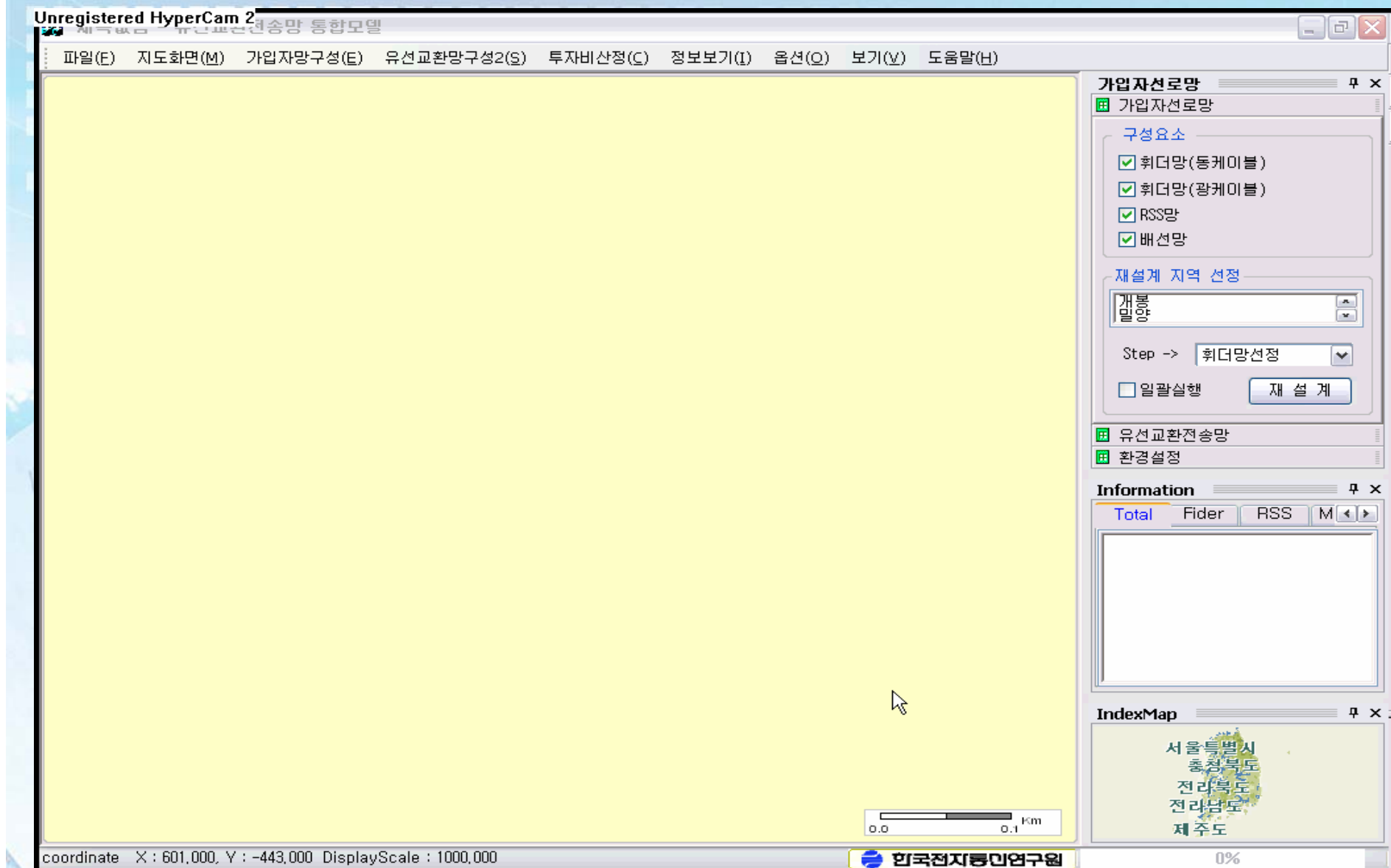
Results of Radio Propagation



Result of Redesigning Backbone



## II-5. Redesign of Fixed Network – Demonstrations

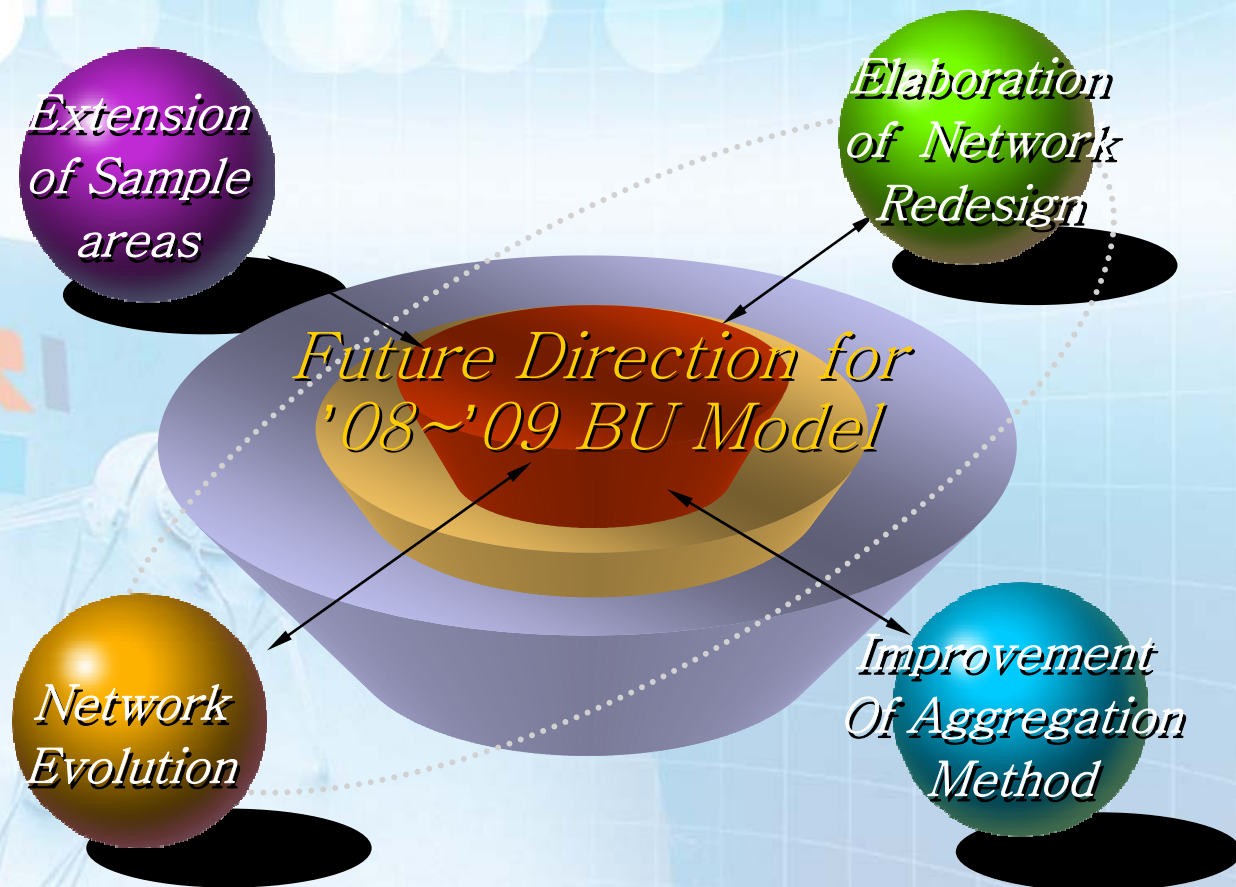


### III Future Development of BU Model

- III-1. Future Direction For '08~'09 BU Model
- III-2. Extension of Sample Area for Network Redesign
- III-3. Elaboration of Network Redesign
- III-4. Network Evolution and Improvement of Aggregation Method

# III-1. Future Direction For '08~'09 BU Model

The BU Model for '08~'09 will be developed based on “① extension of sample areas”, “② Elaboration of Network Redesign”, “③ Network Evolution”, “④ Improvement of Aggregation Method”



## III-2. Extension of Sample Area for Network Redesign

To get more accurate interconnection tariff, the BU Model will increase the number of sample areas for both mobile and fixed network redesign

❑ Fixed : 12 regions ➡ **“20 regions”** (Total 250 regions)

❑ Mobile : 8 regions ➡ **“16 regions”** (Total 157 regions)

※ Same as before, Full redesign of backbone network will be implemented for the years 08-09



- The BU Model employ the following criteria for selection of sample area :  
① geographical characteristics, ② Population Density, ③ Traffic Density

# III-3. Elaboration of Network Redesign

The Bu model will improve the algorithms for mobile and fixed network redesign and modify the radio propagation model for 3G network design



- ❑ Improvement in algorithm for optimized locations of Base Stations(BTS)
- ❑ Improvement in algorithm for optimized local loop based on the information such as the number of subscribers and location 가입자망 구성 알고리즘 고도화 추진

- Fixed : MST Algorithm (for redesign local loop) and TSP Algorithm (for Backbone)
- Mobile : Trial and Error → **Heuristic algorithm**



- ❑ To check if the existing  $L_{vpm}$  model could be applied to 3G network redesign and
- ❑ Develop the appropriate radio propagation model by modifying the existing one

- The BU model will develop the radio propagation model for different band in 3G network and it help to calculate more accurate the investment cost for 3G network elements

## III-4. Network Evolution and Improvement of Aggregation Method

The BU Model will consider the network evolution and improve the aggregation method



❑ Considering the network evolution by operators, it will be decided whether or not to include **3G network and next generation network** in BU model

- Fixed : Consideration of Next Generation Network
- Mobile : Consideration of 3G network



❑ TO get more accurate interconnection tariff, the improvement of aggregation method will be implemented

*Thank You!!!*