# STUDY OF LAND USE, LAND VALUE AND BUSINESS LOCATION CHANGES

## - REF. CODE 5414 -

### FINAL DELIVERABLE WP6: FINAL REPORT

## SUMMARY

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## SUMMARY

The study aims to record/monitor changes that occur in the direct impact zone of Egnatia Motorway S.A. and to estimate the indicators that concern possible changes in various land uses and land value, business location. The present study constitutes the $2^{nd}$ part of a previous study entitled: "Study of land use and land value changes in selected areas in the direct impact zone of Egnatia Motorway S.A. (code of reference 3654)" conducted in 2009 within the framework of a former Action Program of Egnatia Odos Observatory.

The main aim of the study at this second part is to observe and further investigate the impact of Egnatia Motorway and its Vertical Axes in the land use, land value and business location changes.

Overall, the study includes estimations regarding changes based on satellite pictures, the conduct of case studies and the monitoring of Indicators of the Observatory. As mentioned, those estimations are based on Indicators that monitor/assess the developmental and transport impacts of Egnatia Motorway and its Vertical Axes.

The Indicators are the following:

- **ENV07**  Land use changes
- **SET16**  Urban land use changes
- **SET17**  Industrial and commercial land use changes
- **SET18**  Real estate changes
- **SET19**  Business location

The present study recorded the land use and land value changes for the time period Base Year– Control Year, where Base Year is considered the year when IKONOS (2007-2009) imagery are available and Control Year is considered the year of this study.

Regarding the Base Year, the junctions that are reexamined, results from the previous study is used. *As for the study of land-use during the Control Year, satellite imagery of 2017, supplied by Egnatia Motorway S.A are used. Likewise, as far as the new junctions are concerned, satellite pictures imagery from of 2017,) supplied by Egnatia Motorway S.A are also used.* In addition, the study also includes **in-situ** studies *(Verification – Completion of data based on field visits)*, as well as responses to questionnaires regarding to the following:

- *Regarding the Indicator  **SET17** Industrial and commercial land-use changes during the Control Year: Usage of buildings-locations, Vacant locations and buildings, duration of the vacancy of locations and buildings*

- *Regarding the Indicator **SET19** <u>Business location</u> during the Control Year: Categorization of business based on STAKOD 2008 of the Hellenic Statistical Authority (type of business), Number of employees, Starting year of business operation, Purchase or rental or construction of the establishment of the functioning business, Reasons for selecting the location of the functioning business.*

- *Regarding the Indicator SET18 Real estate changes during the Control Year: Value of the land/site, Demand of purchase or rental, Private property or rented.*

The study covered a zone of a variable length round 22 preselected junctions of Egnatia Motorway. With the exemption of the area of Thessaloniki, the width of the area of study is fixed at 1.000m on both sides of the Axe of Egnatia Motorway (total width 2.000m) while the length varies from 2.000 to 10.000m on both sides of the junction under study, depending on the ranking of the junction as regards the intensity of activity. In the area of Thessaloniki (junctions AK21, AK22, AK23 και AK24), in order to estimate the indicator of land use change (ENV07) and the urban land use change (SET16), the zone that determines/sets the area of study is fixed in width of 5x5Km round the junction under study. The junctions in the area of Thessaloniki (from Kalochori to Lagadas) constitute a single zone of study.

The junctions are categorized in three types (below) based on the estimation of the total number of changes and of business locations:

- **Of intense activity** *(area of study 2X10 klm)*

- **Of average activity** *(area of study 2X5 klm)*

- **Of low activity** *(area of study 2X2 klm).*


**For the recording of land -cover(indicator ENV07 Land use changes) the following were used:**

- For the base year: orthoimages IKONOS of spatial resolution of 1m and planimetric accuracy of 5m, on National Transverse Mercator projection and datum EGSA'87.

They are derived from synthetic Pan-sharpened (Panchromatic 1m resolution + Multispectral 4m resolution) satellite imagery with 4 channels (red, green, blue, near infrared), with spatial resolution of 1m, year of capture 2007.

- For the control year: orthoimages of both Worldview1,2,3 and GEOEYE-1 of spatial with resolution of 0.5m and planumetric accuracy of 3 m, on National Transverse Mercator projection and datum EGSA'87.

They are derived from synthetic Pan-sharpened (Panchromatic 0,5m resolution + Multispectral 2m resolution) satellite imagery of 4 channels (red, green, blue, near infrared), with spatial resolution of 1m, year of capture 2007.

- Established boundaries of settlements, Industrial Area etc.

**The steps that were followed for the estimation of the Indicator ENV07 (Land use changes) are:**

1. Production of Ortho-images of Control Year.

2. Classification of Orthoi-mages of control year based on the natural/rural land and on artificial surfaces.

3. Adaptation of established boundaries of settlements, Industrial Area. Reduction of the aforementioned areas from the total range of the area. Creation of a reference area.

4. Data input in the GIS system.

5. Selection from the off-site study area and export of the spatial data that represent each type of land use in a new file.

6. Unification of the area of settlements with that of urban land that occurred based on step #5.

7. Intersection between the spatial elements of the Base Year and the Control Year for each category/type of land use.

8. Estimation of areas of demand and rates of land use change.

**For the recording of the three types of urban construction (Indicator SET16) the following were used:**

- For the base year: IKONOS orthoimages with spatial resolution of 1m and planimetric accuracy of 5m, on National Transverse Mercator projection and datum EGSA'87.

- They are derived from synthetic Pan-sharpened (Panchromatic 1m resolution + Multispectral 4m resolution) satellite imagery with 4 channels (red, green, blue, near infrared), with spatial resolution of 1m, year of capture 2007.

- For the control year: orthoimages of both Worldview1,2,3 and GEOEYE-1 of spatial with resolution of 0.5m and planumetric accuracy of 3 m, on National Transverse Mercator projection and datum EGSA'87.

They are derived from synthetic Pan-sharpened (Panchromatic 0,5m resolution + Multispectral 2m resolution) satellite imagery of 4 channels (red, green, blue, near infrared), with spatial resolution of 1m, year of capture 2007.

- Established boundaries of settlements, Industrial Area etc.

**The steps that were followed for the estimation of the Indicator SET16 were:**

A. Classification of the change in the density of continuous construction

1. Adaptation of the established boundaries of settlements, Industrial Area. Creation of a reference area of estimation of the density of continuous construction during the base year.

2. Locating, based on ranking, of the constructed areas within the reference area of continuous construction, during both the base and control year.

3. Estimation of the change in the density of continuous construction as a percentage (%) of the difference between the constructed areas during the base and control years of the constructed areas during the base year, as decided at Stage #2.

B. Classification of the change in the density of linear construction

1. Digitalization of the basic (National –Regional) road network within the research area, longwise of which both linear and urban construction is observed. Creation of a buffer zone of a total width of 500m having as center the axe of each road. Creation of an area of reference concerning/about linear construction.

2. Location based on categorization of the constructed areas within the range of area of reference concerning/about linear construction, during the base and control years. Location/Reporting of changes.

3. Estimation of the range of change as a percentage (%) to the constructed areas during the base year.

C. Classification of the change in density of non-continuous construction

1. Deduction from the total range of the study area of the areas of reference of continuous and linear construction. Creation of an area of reference concerning/about non-continuous construction.

2. Location based on categorization of the constructed areas within the range of area of reference concerning/about of non-continuous construction during the base and control years. Location/Reporting of changes.

3.    Estimation of the range of change as a percentage (%) to the constructed areas during the base year.

**For the recording of Indicator SET17 (Industrial and commercial land use changes) the following were used:**

- Ortho-images SPOT/IKONOS of the Base Year and of the Control Year.

- Boundaries of established settlements, of Industrial Areas and non- established settlements, as they occur from the processing of the archive of the settlements that was given by the Employer along with an analytical spatial and urban planning research of the specific areas of study.

- Field data (In situ Collection that includes the inventory process based on inventory sheets of the data of each industry).

- Results from Indicator SET 19.

**The steps that were followed for the estimation of Indicator SET17 were:**

1.    Creation of a Geodatabase of spatial and descriptive data (same as Indicator SET 19)

2.    Classification based on the following land use types/categories:

- industrial land (industrial/small industries locations, professional workshops)

- commercial land (wholesale – retail trade locations, trade fairs, exhibition/trade centers, gas stations)

- land for mass transportation locations and transportation centers (transportation, logistics)

- private and public sector services land (administration, services, etc)

- tourism and recreation sites/land (guest houses, hotels, conference centers, kitchen, bars, restaurants)

- social services land (buildings for education i.e. schools, social services, health care, cultural sites, sports facilities)

- land for rural/ livestock facilities (agricultural, forestry, livestock and other rural facilities)

- land for specific use (military locations, religious places)

- infrastructure land (pumping stations, bio cleaning, gas facilities, water supply etc.)

- warehouse land

▪ *The change Indicator for the industrial and commercial land is estimated for the first three categories of land use as well as for the overall land use for services* (locations for private and public sector services, sites for tourism and recreation, locations for social services). *The areas of the rest land uses are included in the data base, however without having being considered at the specification of the Indicator.*

3.  Datainput in the GIS system.

4.  Estimation of the corresponding land και percentages of change.

5.  Production of maps of changes by category of land use.

**For the recording of Indicator SET 18 the following were used:**

A. Data of Market Values regarding the prices of parcels and fields, more specifically:

▪ Stemming from inventory sheets, referring to businesses that are located within the area of study, at the time of data collection, for the Indicators SET 17 and SET 19 quantitative factors are collected regarding prices on field purchase and estimated market values along with qualitative factors about the impact of Egnatia Motorways on property value and on the decision of business location

▪ Stemming from Market Research and interviews with professionals involved in the local Real Estate Market (engineers, real estate agents, constructors) as well as with professional bodies (Department of Agriculture, Chambers of Commerce and Industry etc.) information about estimated market values and trade prices in the specific area

▪ Offered selling prices of fields/parcels found in selling advertisements in the specific area as well as small ads at the local press and on the Net

▪ B. Descriptive and Spatial data deriving from processing Indicators SET 17 and SET 19

**The steps that were followed for the estimation of Indicator SET18 were:**

1.  Collection of Market Land Values for the Base and Control Years.

2.  Specification of zones of differentiation of land value based on the distance from the axis/junction of Egnatia Motorway or/and other specific spots where

differentiation of land value is reported. Specification of average price €/acre per zone category or of average maximum and average minimum price per zone.

3.      Digitalization of land value zones for each study area.

4.      Descriptive data input to the respective tables of spatial characteristics that derived from the digitalization

5.      Thematic output of the surface and linear zones based on their Market Value – Creation of Thematic Maps of Market Land Values for 2009 and 2018.

6.      Estimation and Thematic output of respective rates of change of the Market Land Values in individual zones.

**For the recording of Business location (Indicator SET19) the following were used:**

- Ortho-images s SPOT/IKONOS of the Base Year and of the Control Year.

- Boundaries of established settlements, of Industrial Areas and non- established settlements, as they occur from the processing of the archive of the settlements that was handed over/given by the Employer along with an analytical spatial and urban planning research of the specific areas of study.

- Field Facts/Data (Επίγεια Collection that includes the inventory process based on inventory sheets of the elements of each industry).

The estimation of Indicator SET 19 is based on the processing of the digitalized vector file, which is created with the completion of the procedure of collecting the necessary descriptive information and on in situ research (autopsy) as well as on completing/filling in the inventory sheets.

**The procedure of identifying the Indicator is based on the following steps:**

1. Exemption of the areas of continuous urban construction and also the Industrial Areas

2. Location in ortho-images of all land parcels where any kind of installation may be detected (building or set of buildings)

3. Location of new businesses based on results from inventory data

4. Selection of additional necessary data resulting from inventory sheets, from over the phone interactions, research on the net and from archives with data of various businesses, e.g. the yellow pages

5.  Classification of businesses based on STAKOD 2008 of the Hellenic Statistical Authority.

6. Creation of a Geobase of spatial and descriptive data.

7. Creation of a file/archive of spatial and descriptive data regarding new businesses.

8. Creation of a file/archive of spatial data of the land parcels that include the new businesses

9. Estimation of businesses per field – creation of tables.

10. Creation of maps.

**For the first time in this present study composite Indicators were proposed and studied. For the estimation of these composite Indicators the following were used:**

- Ortho-images SPOT/IKONOS of the Base Year and of the Control Year.

- Boundaries of established settlements, of Industrial Areas and non- established settlements, as they occur from the processing of the archive of the settlements that was given by the Employer along with an analytical spatial and urban planning research of the specific areas of study.

- Results from Indicators ENV07, SET16, SET17 and SET 19.

**The steps that were followed for the estimation of these composite Indicators COMP1, COMP2 and COMP3 are:**

1.  Creation of a Geodatabase of spatial and descriptive data.

2.  Data Input in the GIS system.

3.  Estimation of the objects of the indicators through processing of the spatial and descriptive data of the Indicators ENV07, SET16, SET17 and SET19. Specifically for the Indicator COMP1 there is a combination of the data of Indicator SET17 with the distance from the center of the junction, for Indicator COMP2 there is a combination of the data of Indicators SET16, SET17 and SET19 and finally for the estimation of Indicator COMP3 the data of Indicator ENV07 are related to the distance from the center of the junction.

4.  Production of maps.

## The results of the study in brief are the following:

From the total 233,273 acres that cover all the areas of study the following were noticed:

1. The area of Rural land was reduced from 109,012.66 acres to 107,554.76 with a reduction of 1, 34%.

2. The area of Natural land was reduced from 65.447,88 acres to 64.837,20 with a reduction of 0,93%.

3. The area of Artificial surfaces was increased from 58.812,83 acres to 60.880,99 with an increase of 3,52%.

From the total amount of acres that changed category of land use we now have 1.486,47 (corresponding to a rate 1,46%) acres that were changed from rural land to artificial surfaces, 612,36 acres (corresponding to a rate of 0,94%) that were changed from Natural land to artificial surfaces and 13,22 acres (corresponding to a rate of 0,02%) that were changed from Natural land to Rural land.

From the amount of 233.274 acres that were studied longwise Egnatia Motorway, the continuous construction was increased from 11.832,16 acres in 2007 to 12.132,23 acres that corresponds to an increase of 2,54%. Moreover, the linear construction was increased from 11.544,24 acres in 2007 to 12.427,30 acres that corresponds to an increase of 7,65%. Last, the non-continuous construction was increased from 16.388,77 acres in 2007 to 17.537,66 acres that corresponds to an increase of 7,34%.

Furthermore, to conclude on the aforementioned results, it is noticed that 12 junctions from the total of 21 junctions show greater increase at the linear construction, which can be justified by the impact of Egnatia Motorways to the areas of study.

Overall, it is noticed that the junctions A/K01 Igoumenitsa, A/K09 Grevena, A/K11 Kalamia, A/K12 Kozani, A/K14 Veria, A/K24 Lagadas Serres, A/K29 Ag. Andreas, A/K31 Agios Syllas, A/K34 Vanianou, A/K35 Vafeika and A/K Lefkonas related with the category of construction zone with the biggest change, show a relatively low increase that ranges from 1 to 37 acres. The junctions A/K05 Ioannina, A/K32 Lefki Ammos, A/K37 West Komotini, A/K38 Anat. Komotini, A/K41 Alexandroupoli, A/K Maniaki and A/K Florina show a fairly high increase that ranges from 46 to 139 acres. Finally, the junctions A/K21 Kalochori, A/K22 Ionia-Diavata, A/K23-23A Efkarpia-Girokomio and A/K 32 show a very big increase related with the category of construction zone with the biggest change that ranges from 244 to 332 acres, which is reasonably explained due to their proximity to the city of Thessaloniki.

While studying the results of land use categories/types, of all the junctions that are part of the process of estimating Indicator SET17, it is observed that Industrial land occupies the greatest part of the area in 2009 as well as in 2018 (8345,11 acres and 6715,99 acres respectively), Commercial land occupied an area of 3715,33 acres in 2009 and 3664,94 acres in 2018, Transportation land occupied an area of 790,62 and 725,80 acres and the Services land a total amount of 2083,90 and 1918,55 acres for the base and control years respectively. As far as percentage changes are concerned a decrease at all types/categories is noticed: greater decrease of Industrial land (19,52%), small decrease of Commercial land of 1,36%, decrease of Transport land (7,93%) and that of services land (8,20%). In real values the specific decrease corresponds to 50,34 acres for Commercial land, 1629,13 acres for Industrial land, 64,79 acres for Transport land and 163,34 acres for Services land.

All the land values of the parcels at all the areas of the junctions under study, were reduced. The minimum zone values in 2009 were found in the junctions AK035 Vafeikon, AK037 Komotinis estimated at 2.000 € per acre as well as in the junctions of the vertical axes of lefkonas, Florina and Maniaki estimated again at 2.000 €. The maximum zone prices in 2009 were found in the junctions AK014 Veria and AK023 Efkarpia estimated at 250.000 and 200.000 € per acre. Respectively in 2018 the minimum zone value was met in the junction AK11 kalamia estimated at 600 € per acre while the maximum remains at the intesections AK014 Veria and AK023 Efkarpia estimated at 100.000 € per acre.

The changes in land values generally present negative outcomes between the base year (2009) and the control year (2018). The minimum change per zone was detected at the intersection AK014 Veria (-20%) regarding the intersections of Egnatia Motorways while in the junctions of the vertical axes change is noticed at the intersection of Lefkonas (-10%). The maximum amount of change per zone at the junctions of Egnatia Motorways is detected at the junctions AK024 Lagadas, AK032 Lefki Ammos and AK037 West Komotini showing a rate of -90% change whereas at the vertical axes the maximum amount of change per zone is detected at the junction Maniakoi with a rate of -50% change.

The average change of land value as regards all zones of junctions is -55%. More specifically, as for the junctions of Egnatia Motorways the average change is -59% as for the ones of the vertical axes the average change is -31%. The lesser average change of land value is detected at the junction AK031 Agios Syllas (-21%) and the greatest at the junction AK041 Alexandroupolis (-79%). To be noticed that the average change of land value is more than -50% at all junctions except from the following: AK021 Kalochori, AK022 ionia-Diavata, AK23 and AK23A Efkarpia as well as those of the vertical axes, Lefkonas, Florina, Maniakoi.

In total, in the area of study 3.110 businesses are established/located at all junctions. Of those businesses:

1.332 (42,83%) are old ones, established in or before 2009, that were operating until the end of control year-2018,

847 (27,23%) were closed during the control year 2018,

630 (20,26%) are businesses whose sector has changed from 2009,

198 (6,37%) are new businesses established after 2009,

18 (0,58%) are businesses under construction that weren't operating during the time of autopsy/research that was conducted during the control year-2018,

16 (0,51%) are businesses that was impossible to gather information about during the time of autopsy/research and

69 (2,22%) new business locations for rent where no business is yet established.

The highest number of businesses is dealing with Manufacturing 924 (29,71%) businesses in total followed by those working with Commerce- 1245 (40,03%) businesses in total, and finally Transport and Logistics with a total of 255 (8,20%) businesses. The type of operation was not recorded for 201 (6,46%) businesses. Of all the types of operation the one with the greatest rate out of 2176 active businesses is Manufacturing, with a record of 630 (28,95%) businesses in total out of which 17 (0,78% of the total) are new, followed by Commerce with 980 (45,04%) businesses in total out of which 106 (4,87%) are new finally Transport and Logistics with 173 (7,96%) businesses in total out of which 25 (1,15%) are new. For 16 (0,74%) businesses the type of operation was not recorded out of which 8 (0,37%) new.

As regards the classification/ranking of active businesses based on sector of production there have been recorded 116 (5,33%) establishments/locations/businesses of primary sector, 705 (32,40%) of secondary sector, 1339 (61,53%) of tertiary sector and 16 (0,74%) whose sector of activity/type of operation was not recorded. Moreover, regarding the classification/ranking of new businesses based on sector/field of production there have been recorded 8 (4,04%) establishments/locations/businesses of primary sector, 38 (19,19%) of secondary sector, 152 (76,76%) of tertiary sector and 8 (4,04%) whose type of operation was not recorded.

From the above regarding the inventory process and its outcomes we conclude to the following:

The study was mostly effective and complete as from the total of businesses under study it was impossible to gather data for 16 (0,74%) only whereas for 201 businesses (6,46%) the sector of activity was not recorded.

Low rates of newly established businesses were reported (198 – 6,37%) in contrast to the rates of non-active (closed down) businesses (847 – 27,23%). Also an important rate of businesses that have changed sector of activity was reported (630 -20,26%).

As regards the sectors of production the tertiary sector presents overwhelming rates for the total amount of new businesses (76,76%); In total 152 out of 198 them belong to this field and only 19,19% (38 businesses) to the secondary sector. As for the type/field of activity most of the newly established businesses, 106 out of 198- 53,54%, are part of the sector of Commerce.

While studying the business land use change in relation to the distance from the center of the junction (indicator COMP1) regarding the junctions of low concentration, where, as it also resulted from the studies of indicator SET 17- Industrial and commercial land use change, indicator SET19- Business location were the rate of land use change appears to be low the following conclusions are reached:

No change is recorded at the junction Kalamia-Kozani. A small rate of business land use change is found at the junctions of Alexandroupoli, Maniakoi, Kastoria and Florina, which are located within proximity (less than 500 m distance from the center of each junction). At the junction Vafeika-Xanthi no land use change is recorded for businesses located within a distance of more than 1000 m from the center of the junction. At the junctions Igoumenitsa, Agios Syllas and Lefkonas land use changes concern businesses that are located within a distance of more than 1000 m from the center of the junction, while in the rest of the junctions a greater expansion of businesses is noticed as far as the indicator for business location at a distance of more than 500 m proximity from the center of the junction, is concerned.

While studying the business land use change in relation to the distance from the center of the junction (indicator COMP1) regarding the junctions of average concentration the following is concluded: Regarding all junctions there seems to be an dispersal in land use at all kinds/cases of distance from the center of the junction, with minimum or none change within a distance of less than 500 m. At the junction of East Komotini no land use change is reported in businesses located εγκατεστημένων within a distance of more than 1.500 m from the center of the junction. At the junctions of Kozani, East and West Komotini, the change in land use is reported in very few located businesses.

Moreover, as far as business land use change in relation to the distance from the center of the junction (indicator COMP1) regarding the junctions of maximum concentration are concerned we conclude as follows: At the junction of Kalochori and Ionia there is a low rate of located businesses with a change in land use as far as their location is within a distance of less than 500m from the center of the and with a normal spread in the rest of the cases. Totally, at the junctions of Thessaloniki, concluded the ones besides the aforementioned junctions and those of Sindos, Girokomio and Lagadas, there appears to be a normal spread of business location that has showed land use change when located at a distance of less than  500m from the center of the junction. During the study of the density of new or closed down business

location at the junctions of low activity and in relation to linear urban construction round vertical axes, national and regional roads (Indicator COMP2) minimum new business location is recorded (less than or up to 3) both within and out of the zone of linear construction. The same applies to the case of closed down businesses that are little less than the newly established ones.

While studying on a scale of 100% the change of active businesses within the linear construction between 2009-base year and 2018-control year in total, concerning the junctions of low concentration, it presents a raise of 17,10% (129 active businesses in 2018 whilst 114 in 2009).

While studying on a scale of 100% the change of active businesses within the linear construction between 2009-base year and 2018-control year in total, concerning the junctions of medium concentration, it represents significant reduction of 22,82% (425 active businesses in 2018 whilst 522 in 2009).

While studying on a scale of 100% the change of active businesses within the linear construction between 2009-base year and 2018-control year in total, concerning the junctions of maximum concentration, it represents significant reduction of 23,05% (694 active businesses in 2018 whilst 854 in 2009).

While studying on a scale of 100% the change of active businesses within the linear construction between 2009-base year and 2018-control year in total, concerning the junctions of the area of Thessaloniki, it represents significant reduction of 25,31% (723 active businesses in 2018 whilst 906 in 2009).

While studying on a scale of 100% the change of active businesses within the linear construction zone between 2009-base year and 2018-control year in total, concerning the junctions of the area of Thessaloniki, it represents significant reduction of 11,24% (525 active businesses in 2018 whilst 584 in 2009).

While studying on a scale of 100% the change of active businesses within the linear construction between 2009-base year and 2018-control year in total, concerning the junctions of Egnatia Motorways, it represents significant reduction of 19,39% (1.248 active businesses in 2018 whilst 1.490 in 2009).

To conclude, in total only in the case of intersections of low concentration there is a raise in the rate of change of active businesses in the zone of linear urban construction. The specific raise concerns specifically all the junctions of low concentration except from those of Vafaika-Xanthi (where significant reduction of 40% is reported), Agios Syllas (7,69%),

Alexandroupoli (13,33%) and Vanianos-Xanthi where there are no records of any active businesses within the specific zone during both years of reference, i.e. base and Control.

Also, there are no records of junctions of neither medium nor maximum concentration with a raise of the rate in change of active businesses, and among these the junction of Lagadas (of medium concentration) demonstrates/presents the highest reduction (79,31%) and the junction of Kalochori (of maximum concentration) presenting the lowest reduction (7,32%).

While studying the change in land use (range) regarding the distance from the center of the junction (concerning junctions of low rates of business location) the outcome is as follows: At a distance of 0-500m the rate of change of natural and rural land to artificial surface is 35,72%, at a distance of 500-1.000m the rate of change of natural and rural land to artificial surface is 53,33%, at a distance of 1.000-1.500m the rate of change of natural and rural land to artificial surface is 7,88% and finally at a distance of 1.500-2.000m it is 1,36%.

While studying the change in land use (range) regarding the distance from the center of the junction (concerning junctions of medium rates of business location) the outcome is as follows: At a distance of 0-500m the rate of change of natural and rural land to artificial surface is 8,18%, at a distance of 500-1.000m the rate of change of natural and rural land to artificial surface is 44,67%, at a distance of 1.000-1.500m the rate of change of natural and rural land to artificial surface is 24,78% and finally at a distance of 1.500-2.000m it is 13,59%.
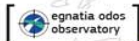
While studying the change in land use (range) regarding the distance from the center of the junction (concerning junctions of maximum rates of business location) the outcome is as follows: At a distance of 0-500m the rate of change of natural and rural land to artificial surface is 3,27%, at a distance of 500-1.000m the rate of change of natural and rural land to artificial surface is 10,85%, at a distance of 1.000-1.500m the rate of change of natural and rural land to artificial surface is 23,23% and finally at a distance of 1.500-2.000m it is 17,06%.

While studying the change in land use (range) regarding the distance from the center of the junction (concerning junctions of maximum rates of business location) the outcome is as follows: At a distance of 0-500m the rate of change of natural and rural land to artificial surface is 10,68%, at a distance of 500-1.000m the rate of change of natural and rural land to artificial surface is 27,27%, at a distance of 1.000-1.500m the rate of change of natural and rural land to artificial surface is 23,23% and finally at a distance of 1.500-2.000m 13,21%.

While studying the change in land use (range/έκταση) regarding the distance from the center of the junction (Indicator COMP3) the outcome is as follows: At a distance of 0-500m the rate of change of natural and rural land to artificial surface is 3,65%, at a distance of 500-1.000m the rate of change of natural and rural land to artificial surface is 12,35%, at a distance

of 1.000-1.500m the rate of change of natural and rural land to artificial surface is 23,68% and finally at a distance of 1.500-2.000m it is  16,59%.