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A National Assessment of Sustainable Development Indicators in Turkey with examples of Local Scale Modeling Using a Systems Dynamics Approach



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Abstract

Sustainable development has been the key-phrase of current times; however, it is crucial to also keep track of the progress to reaching the ultimate goal of sustainable development through measurable terms. This is where indicators step in, to point out, both qualitatively and quantitatively, how much achievement is being made under this paradigm. Measuring progress, with a compilation of indicators, will create the possibility of formulating strategies to bring forth priority areas of concern that need attention on the pathway to achieving sustainable development goals. The primary objective of this study will be to reflect upon Turkey's efforts on establishing national sustainable development strategies in relevance to internationally renown indicator sets. Simultaneously, a real world, local modeling example will be carried out, with the adoption of a systems dynamics approach that illustrates how multiple variables are interlinked to making forecasts on future sustainability outcomes. Two provinces of Turkey, Erzurum and Izmir, that reveal very differing characteristics, have been evaluated upon within the framework of a comparative case study for the model. As the final output of the model, two variables: the changes in the quality of life and local development have been observed over the two provinces within a span of twenty years via using the STELLA software. Interpreting the model results will create possibilities to propose shifts to sustainability transitions according to local demands and trends. Overall, this thesis aims at bringing together the principles of national strategies established on the path towards sustainable development while continuously feeding in the indicator outcomes that illustrate the needs and demands of local concerns. Ultimately, an all embracing approach can be adopted in principle to formulate strategies for future sustainability policies within national, regional and local contexts.

Keywords: Sustainable Development, Indicators, Local Modeling, Turkey, Izmir and Erzurum Provinces, Systems Dynamics, STELLA

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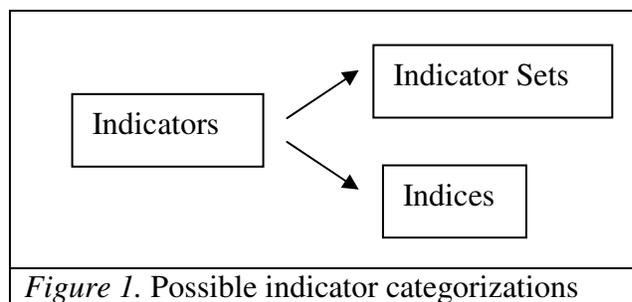
*“Measure what is measurable,
and make measurable what is
not so” (Galileo Galilei)¹*

1. Introduction

The concept of developing indicators to measure progress on the pathway to achieving sustainability has become a very ‘hot topic’ in the recent years be it on a global or a local scale. Not only does it provide a basis of being a tool of measurement, but it also guides the concept of sustainability to quantifiable terms, something to validate upon and reveal tangible results. Hence, as the name implies, indicators are a collection of illustrative data that point out the *expedition* from a reference point to another future reference point. Numerous indicators have been developed over the past years, ranging from local settings to global scales to show both qualitatively and quantitatively, the transition, highlighting the process of moving into an era with a focus of sustainability in mind. Concerns of integrating the concept of sustainability into the development paradigm have supported the advancement of these indicator sets that take on the role of a decision making tool which assist the construction of future policies formulated around the concerns that these indicators tend to reveal.

Yet, a reoccurring contradiction for indicators arise, where with the ‘growing complexity’ of our systems more complicated data is required for understanding interactions.² Still, on the other hand, there is a constant ‘demand for simplicity’ for effectual understanding without underestimating the existing complexity.³ Hence, it is imperative to establish such system where a straightforward approach that does not hinder the complexity of systems be embraced when selecting indicators for analysis.

Indicators can be used to further develop into indicator sets or an aggregate, overall index as seen in Figure 1. *Indicator sets* can target sub themes on the overall achievement to sustainability where a group of indicators are assessed all together for the common target. *Indices*, however can commonly be regarded as a combination of indicators under a common unit so it is easier to asses the overall degree or ranking.



To make sense of indicators and understand its areas of applicability, it is probably best to consider indicators within a national scope. For this reason, this thesis is aimed at investigating sustainability indicators under a Turkish National context.

¹ Galileo Galilei cited in MacGillivray A., 1998 with further reference to Gaardner, S. 1995

² United Nations Development Programme (UNDP), 2002, pg 137

³ United Nations Development Programme (UNDP), 2002, pg 137

2. Methodology & Materials

2.1 Objectives and Scope of the Problem

The main objective and central focus of this thesis (presented in *Part I* of the study) is initially to analyze Turkish National Strategies on Sustainable Development, make use of existing indicators to monitor progress on this intended path and conduct a mental gap analysis of where attempts fall in place compared to European or internationally accepted standards. With the study of the differences between Turkish, European Union (EU) and international indicator sets and applications, it would then be possible to propose a shift, illustrating areas of priority to get from the existing situation to the better. Subsequently, a local scale sustainability assessment is to be carried out as to represent a real world example with a modeling application illustrating the importance of indicators (presented in *Part II* of the study). Here, modeling attempts based in two very different provinces will be conducted to show changes in multiple variables and illustrate how the overall quality of life is perceived and how local development is to show variation with time. Thus two provinces, IZMIR from the highly developed Aegean Region and ERZURUM other from the lesser developed region of Eastern Anatolia of Turkey have been selected for the local scale modeling examples. A comparative case study will then reveal different trends that different provinces tend to opt.

The main *research questions* that are to be answered with the scope of the study are as follows:

- What is the current status of sustainable development strategies and indicators to measure progress in Turkey in comparison to European and international standards?
- How to assess sustainability levels on a regional/city scale?
- How to combine both top down approaches with bottom up? Where do they converge?

2.2 Methodology

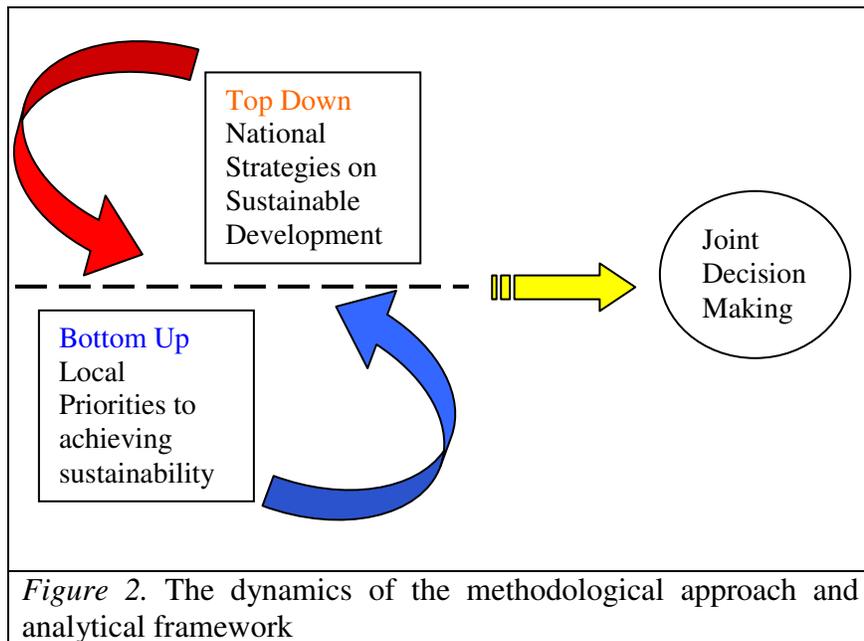
“While being very useful in some ways, sets of indicators suffer, in that they are static in nature and lack interactivity.”⁴ “They provide a snapshot, but do not show the dynamic relationships between indicators.”⁵ For this reason, it is then essential to level up this snapshot to the form of a scenario where all the variables and their interactions, may yield dynamic relations extended out for future predictions.

Up till now, much of the core indicator sets have been established based on an international context where applicability falls entirely upon the state to bring it down to a national or regional level to evaluate success and performance on assessing how much is served in participating to the aim of sustainable development. In the attempt of bringing down universally accepted indicators to a national context, it is crucial to formulate strategies that embrace sustainable development at heart but also protect national priorities that are country specific and quite possibly unique. In this respect, within a Turkish context, a specific definition of sustainable development (also referred to as **Sustainable Development A-LA-TURCA**) has been defined as follows: “Turkey, with its rapidly growing economy, aims at improving the competitiveness of its economy and people’s quality of life,

⁴ Rothman D.S., Robinson J.B. and Biggs D., 2002. Pg 182

⁵ Rothman D.S., Robinson J.B. and Biggs D., 2002. Pg 182

particularly putting the young and dynamic population at the center. Within that perspective, we see Anatolia’s unique and diverse nature not solely as a resource, but rather as a “life” itself for the future generations’ prosperity.”⁶ Thus, this philosophy and country exclusive approach should be kept in mind when future strategies and policies are formulated. Simultaneously, within this process, a core fact that should not be underestimated again is that, feeding beliefs and priorities of social networks and citizens into national strategies will enhance the overall synergy. So, this is the exact point where the methodological framework (Figure 2) aims at tackling; in line with the last research question (How to combine both top down approaches with bottom up? Where do they converge?). In the process of defining policy options for development with the idea of a sustained standing in mind; proceeding from two parallel directions is essential. National strategies should make way whilst bringing forward local priorities until both approaches converge to the *common level* where they can be meshed. Hence, this thesis is formulated in two parts; Part I where the National Strategies are analyzed and Part II where local priorities are investigated (via modeling of two provinces) to eventually merge the two approaches to achieve a ‘joint decision making’. The two parts are aimed at complementing one another in achieving a sense of completeness.



For Part I, the top down approach will cover the analysis of **initial** efforts and supporting documents that have been made on the pathway of reaching a ‘National Sustainable Development Strategy’. For the process of analyzing local priorities in Part II however, a provincial scale analysis has been taken as a basis. It is essential to observe that conducting local analyses on a provincial scale will help observe changes easier on a small scale model since provinces or cities can be considered to be more decentralized functional units.⁷ A modeling software known as STELLA that applies a systems dynamics approach will be used to model interactions among variables within a province to make way

⁶ “Integration of Sustainable Development into Sectoral Policies – The Turkish Case” Presentation

⁷ Özkaynak Ortaköylüoğlu B., 2005, pg 34

to local analyses. Afterwards, leveling this small scale modeling up to the national scale can precede a lot smoother. Metaphorically; each province, as a functional unit within itself, could be represented as the parts of the puzzle and eventually completing the pieces of the puzzle would assist to the generation of the National Strategy. Also, in this respect, on the process of assessing performance via indicators even on a local scale; it is important to bear in mind that the selected pathways of each province to achieve development in their own sense are to show wide scale differentiation. Therefore, it should be acknowledged that the results that sustainable development indicators reveal will show great variation on a regional, city or even urban to rural circumstance. Hence, it is critical to establish, develop and evaluate indicators in a dynamic context specific to *that location* in spatial terms.

2.3 Materials

In an attempt to answer the directed research questions, a relevant literature review was conducted initially on a national scale. So far, numerous documents have been published to assist Turkey, on its efforts to yet still developing a National Strategy on Sustainable Development. These supportive documents assisting to the process can be regarded as the ‘raw material’ that are to feed into the National Strategy on Sustainable Development. After seeing where Turkey would position itself on these efforts, more local environmental strategies have been a central focus.

National Scale Reports	Local Scale Reports
<ul style="list-style-type: none"> • Development Plans for Turkey • National Environmental Action Plan (NEAP) 1999 • EU Integrated Environmental Approximation Strategy (2007 - 2023) by the Ministry of Environment and Forestry • Strategy documents of the State Planning Organization in line with Regional Development, Sector Profiles and Development, Millennium Development Goals and in line with Sustainable Development • National Stocktaking Exercises 	<ul style="list-style-type: none"> • City Master Plans and Environmental Plans • City Council Reports

Scientific articles, books, relevant other publications and implemented case studies have been consulted to provide a basic overview and introduction to the case of indicators and their applications on monitoring progress within a national or local context. Several meetings and unofficial interviews have been conducted with relevant experts from the State Planning Organization (SPO), State Statistical Institute (TURKSTAT), significant ministries (Ministry of Labor and Social Security), academicians (from Middle East Technical University, Ankara; Bilkent University, Ankara) province and regional chambers (Aegean Region Chamber of Industry) and several international project coordinators from the academic world (European Union Framework Programme 6, Insure Project Coordinator) in gathering data or consulting upon subjective information. In addition, a field visit to Izmir has been made, initially to make an observational study and also to seek advice from local academicians (9 Eylul University, Izmir; Izmir University of Economics) on their opinion of the local scale modeling and the interaction of variables that define the leading sectors of the city.

2.4 Data

For the analysis of National Strategies on the way to sustainable development in Part I, institutional plans have been the main point of initiation also feeding in critiques from the academic world. A majority of the data that have been calculated and processed as input data to the model for Part II are secondary sources of data from the study conducted by the State Planning Organization that presents measured indicators for the study of ‘Socio-economic Ranking Research of Provinces and Regions’.⁸ Data range from demographics, characteristics of the regions, infrastructure records of the two selected provinces of Izmir and Erzurum. Other data beyond the scope of this study have been gathered from TURKSTAT and relevant ministries and provincial governorships.

2.5 Limitations

Initially, it should be noted that all the links and causalities between variables that have been used in the generated mental model and the actual model itself have been rather subjective. Different viewpoints and ways of perception may alter the system of thought and conclusions entirely. However, the indicators and variables that have been selected within this research have been chosen from a wide range of the spectrum of sustainability, encompassing all pillars (economic, social, environmental and institutional) and have all been evaluated to be as comprehensive as possible. Yet again, the scope of the model could be altered; limited to narrow down the results or expended indefinitely to nest as many variables as possible with utmost detail. Another limitation that falls under the category of subjectivity could be about the relative weights assigned to each indicator during the assessment phase. However, the main strategy was to assign equal weights to all indicators to not bring forward or leave behind any of the contributing variables.

Also, another foremost limitation with the scope of the research is that since a common dataset under the notion of sustainable development indicators is inexistent in Turkey, the datasets that have been gathered for the purpose of analysis have been brought together from numerous different institutions and sources and hence might be inconsistent. However, they have been tried to be brought together under the same starting date of the year 2000 for the analysis, though exact precision of the data could be subject to question.

3. Introduction to Established Indicator Sets

3.1 Indicator Sets of Importance to Turkey

Numerous indicator sets have been widely adopted on the international agenda. The main ones that can be accepted of importance to Turkey can be listed as:

- The United Nations Commission on Sustainable Development (UNCSD) Indicator Set,
- The Organisation for Economic Co-operation and Development (OECD) Core Indicator Set,
- The European Union EUROSTAT Indicator Set and
- The Mediterranean Action Plan (MAP) – Plan Bleu Indicators.

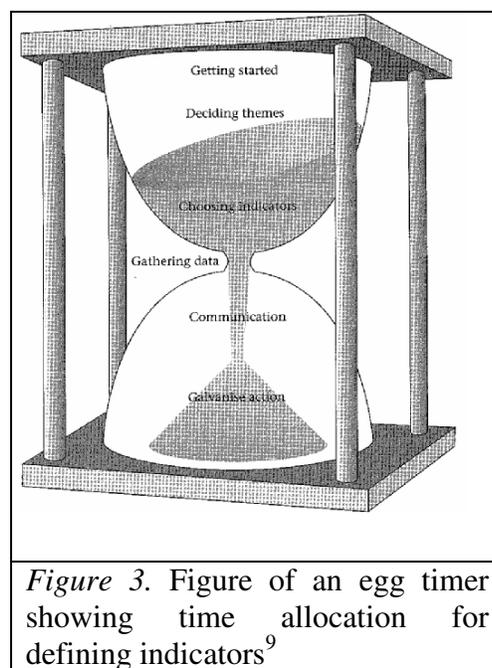
⁸ Dincer B., Özaslan M., Kavasoğlu T., 2003

The scope and the targets for each indicator set differ in principle, however all sets have the underlying notion of sustainable development as the basic target to achieve. The terms of coverage, methods used to derive indicators, strengths and weaknesses of each applicable indicator set vary; initially to satisfy priority objectives either on a global scale like the UNCSD Indicators or to assess sustainability achievements more on a regional scale like the EU EUROSTAT, OECD or the MAP Indicators. The scope, for example, of the UNCSD Indicators target the broader goal of assessing sustainability within the economic, social, environmental or institutional dimensions under core themes; however, it could also address more case specific goals like achieving a common sustainable tourism strategy like the MAP Plan Bleu Indicators. Yet, the crucial point of all applicable indicator sets from a Turkish national perspective is to monitor progress that is achieved in each separately; assessing the degree of satisfaction in each category with different objectives.

3.2 Indicator Based Assessment Approaches

Developing indicators that need to be measured is quite a state of the art. To this respect, numerous methods have been used in deriving and interpreting indicators and a widely renowned type is known as the *Pressure–State–Response (PSR)* method which has also been adopted by the OECD. The Pressure State Response Model has been generated in order to define the stress causing factors and to respond to them effectively according to the present state that they tend to reveal via the warning of indicators.¹⁰ So, relevantly, indicators are used to evaluate changes that have caused the current state and propose alternative responses to mediate the situation. Another used framework is known as the *Theme Indicator Framework* also used by the United Nation Commission on Sustainable Development (UNCSD) where, according to an area of priority, relevant targets are set and conditions to relieve pressures to achieve these targets are the primary objective.¹¹

However, despite the method used to apply an indicator based assessment, the main problem that is encountered when using such an approach is that *selection* of relevant indicators tends to be rather tedious and time consuming.¹² Figure 3, shows the allocated time slots that are spent when implementing an indicator based assessment approach. Once the theme is decided upon, it is seen that choosing the most appropriate indicators is the most time consuming procedure when trying to convey a message. Gathering data and communicating this message are seen to be less troublesome within such a process.



⁹ MacGillivray A., 1998 with further reference to MacGillivray A. and Zadek S. 1996

¹⁰ United Nations Development Programme (UNDP), 2006 a, pg 57

¹¹ United Nations Development Programme (UNDP), 2006 a, pg 59

¹² MacGillivray A., 1998

4. PART I - Turkish National Strategies on Sustainable Development

4.1 Turkey's Strategic Positioning on Sustainable Development and its Evolutionary Procedure

Viable transformations on progressing toward development have taken place in Turkey in the past and near present. Transforming into a market economy, investing in the dynamic market forces of the private sector and undergoing continual efforts to adapt to the changes in the political agenda, to the instabilities of the economy¹³ and the changes in the social structure have been areas of priority. As a traditional approach in many developing countries like in India or in China for example; the preparation of periodic national development plans are the basic approach in setting out the main objectives, where sectoral policies are usually defined by relevant ministries and government institutions with occasional contribution of other actors (such as special thematic working groups composed of representatives of Non Governmental Organizations, Universities and the private sector) and the overall coordination is conducted by the national planning organizations.¹⁴ Relevantly; setting the framework for establishing national strategic plans for development on a five year basis has been the main guideline for future initiatives conducted by the State Planning Organization (SPO) in Turkey since 1963. Throughout the years, numerous structural and institutional reforms have taken place; mainly but not limited to agricultural reforms, urban planning, formulation of future energy policies, defining incentives for the development of the private sector and principally setting way to determine future strategies to integrate Turkey into to the globalizing world of tomorrow.

During the period of ongoing reforms until the 21st century, environmental concerns had mainly taken place as a sub category under the more dominant spheres of economy and society. A clear illustration to this can be seen in the third 5-year development plan (1973-1977) for example; where despite having a sub category under an 'environmental' heading, the fundamental approach refrained from adopting policies that would hinder development and industrialization in principle.¹⁵ The fifth 5-year development plan however (1985-1989), not only set policies for pollution prevention but also highlighted the necessity and importance of formulating new policies for the purpose of preserving natural resources for future generations, hence bringing forward preventive measures and policies.¹⁶ Following the RIO Earth Summit; environmental matters had a peak period and with the seventh 5-year development plan (1996-2000), a National Environmental Action Plan (NEAP) was prepared in an attempt to determine priority environmental policies and resolution plans for the environmental category to undergo a complete structural change.¹⁷ The generation of the NEAP has been a very enlightening process where initially 800 experts and subsequently 100 stakeholders were brought together to identify priority areas for Turkey on defining environmental management options and policies where sectoral degrees of importance were determined.¹⁸ The NEAP had four priority areas where it focused on better quality of life, increased environmental awareness, improved environmental management and sustainable economic, social and cultural development.¹⁹ However, until today, there

¹³ Talu N., 2007 pg 19

¹⁴ United Nations Development Programme (UNDP), 2002, pg 38

¹⁵ Talu N., 2007 pg 19

¹⁶ Talu N., 2007 pg 19

¹⁷ Talu N., 2007 pg 12

¹⁸ National Environment Action Plan Of Turkey (NEAP), 1999 pg 7

¹⁹ National Environment Action Plan Of Turkey (NEAP), 1999 pg 7

has been no significant tracking to measure how much of these objectives have been reached and despite a suggestion of a monitoring mechanism, such an initiative has not been conducted and is still held in suspense.²⁰

With the beginning of the new century where globalization and transnational initiations began living their era of glory; an effort of integrating national economies into this massive wave of flux had become inevitable. Within this period, Turkey began facing a period of structural distress with economic volatilities and exhaustion from coalition governments all resulting in instability and calls for early elections. However, despite this chaotic period; positive achievements such as European Union negotiations became priority objectives to be looking forward to. On a timeline axis, it can, without doubt, be observed that the increasing importance of the environmental dimension is gradually making its way through to becoming a principle priority in the national strategic objectives, but still barriers awaits to be overcome. Although, monitoring of implementing environmental goals has been absent and lacking; expectations in successful environmental policy making has risen along with the struggle to fulfill these expectations.

On the progress towards the European Union accession period, Turkey awaits many challenges in the Environmental Chapter. As the targets and goals are constantly being elevated to meet better standards, Turkey is facing many challenges to meet this “moving target”²¹ for better environmental conditions. According to the ‘Turkish National Environmental Strategy’ the cost of full compliance to EU standards ranges around 60 billion Euros to be fully implemented in the span of 23 to 24 years.²² However in return, a 120 billion Euro benefit is expected with an increase in quality of life, human health, increase in life expectancy, and much more.²³ In this respect, it is seen that investment in the environmental sector is bound to yield more than double in financial terms and vast benefits of human life beyond measure; however long term commitment is needed to achieve these goals. Present trends reveal that under the current government, the 2007 budget that has passed the national parliament is a striking indication of how important nature and the environment come into concern in Turkey.²⁴ The allocated portion of the budget to the Ministry of Environment and Forestry is 967 Million YTL (around 513 Million Euros) whereas the portion allocated to the Department of Religious Affairs is 1.6 Billion YTL (around 848 Million Euros) for example.²⁵ The current portion of the budget allocated to the Ministry of Environment and Forestry only covers around 0.855% of the foreseen budget required for the full compliance to EU Environmental Standards. In this respect, it is possible to derive the conclusion that a common notion to embracing the concept of environmental sustainability within the country, be it in terms of policy making, investment or public concerns is still deficient.

As observed in the case of many developing countries, several core problems have been identified that all contribute to the lack of a common notion of the Sustainable Development belief within the country. It should be noted that, in line with this lack of a common notion; “[i]nsufficient

²⁰ Talu N., 2007 pg 14

²¹ Sarıgül, G., 2007

²² Sarıgül, G., 2007 adopted from the Ministry of Environment and Forestry, 2006, EU Integrated Environmental Approximation Strategy (2007 - 2023)

²³ Sarıgül, G., 2007

²⁴ Ünlütürk E., 2006 pg10

²⁵ Ünlütürk E., 2006 pg 10

operationalization of the Sustainable Development concept is the main impediment to designing and implementing effective sustainable development policies.”²⁶ The central critique to the underlying reason of a lack of a common understanding to the notion of sustainable development can be linked to the concentration of power to the utmost traditional state based governance mechanism. This can be exemplified with the pattern where the framework of national objectives and strategies are directly dependant on the customary five year development plans, developed and coordinated by the State Planning Organization. In an attempt to resolve this existing setback; this fixed and existent hierarchy should be canalized towards a shift to a ‘governance without government’²⁷ paradigm where multi-level governance gains importance with existing feedbacks among all relevant bodies.

It should also be acknowledged that Turkey’s priorities are currently dominated by more strategic and political problems that await (such as poverty, foreign policies, current instabilities in the neighboring country of Iraq and many more). Under these circumstances, the development planning up till date has evolved mainly around these predominant spheres where the environmental dimension has regrettably lagged behind. However, it should be highlighted that achieving success can only take place where environmental concerns are in balance with economic, social and political concerns. Unless so, it can only be regarded as the mis-conception of sustainable development at all levels. The environmental sphere need be placed among priority objectives within the national agenda and integrating sustainability objectives into central planning goals need be crucial.

Lately, the communication between the scientific world and politics has undergone improvement where “[d]esignated expert groups and independent scientists have, to a large degree, been incorporated within the negotiation setting.”²⁸ However, the importance of feeding academic ideologies into policy making is *only* emerging. Yet, the situation seems optimistic; sector specialists, international and national consultants are being integrated into the procedure of policy making so as to incorporate environmental and sustainability aspects into the decision making process. However, it would not be possible to regard the system as a full participatory one unless there is a strong feedback from the local level and unless concerns rising from grass roots activities are recognized in the process of policy making. Most recently, the greatest example to illustrating rising grass roots activities can be regarded as the large scale demonstrations that are currently either ongoing or have been held in Turkey during the Months of April and May 2007. Very large crowds (unofficial numbers estimating over a million for each demonstration) came together to demonstrate objections to presidential candidates who were thought to be incompatible with the secular and democratic principles of the nation.²⁹ Such great grass roots gatherings have finally responded to going for early elections in the country. Such initiatives can be regarded as great success for taking local concerns into account and they are seen to alter the decision making process entirely.

²⁶ Kobus D., 2007

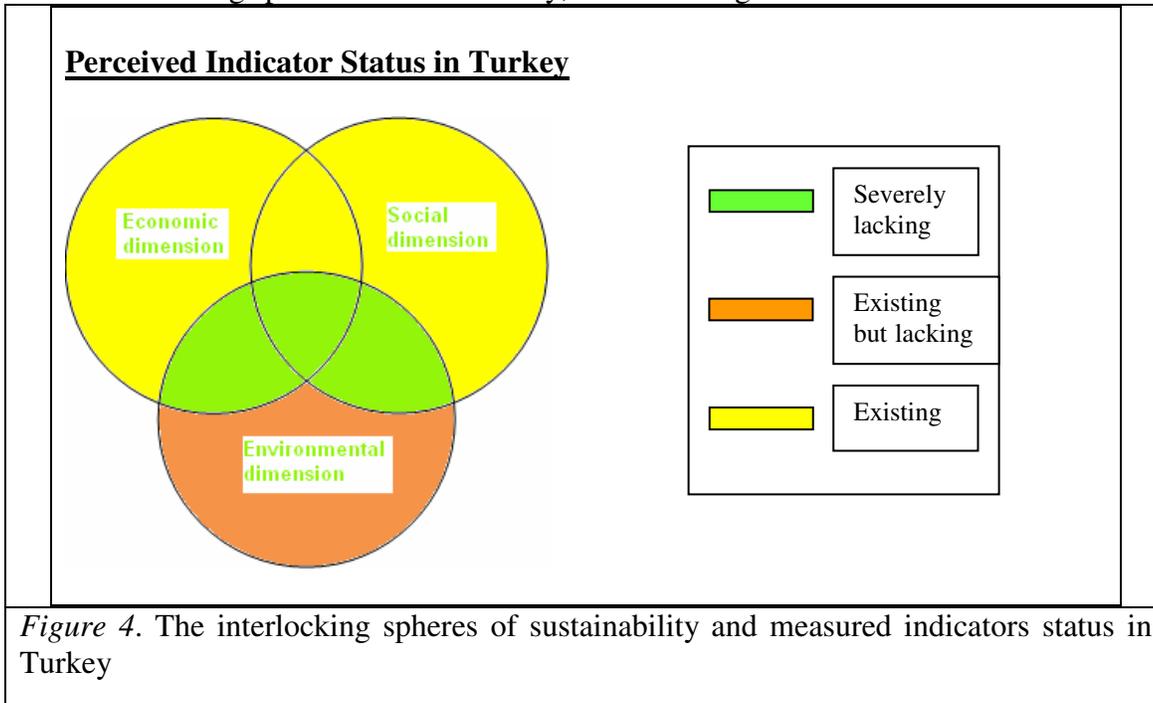
²⁷ Netherlands Organisation for Scientific Research (NWO), 2004 pg 4

²⁸ Kanie N. and. Haas P.M., 2004 pg 4

²⁹ Turkish Daily News, April 16, 2007, Kanlı I Y. (eds)

4.2 Fulfilling data requirement from a Turkish Perspective

In terms of information and data prioritization, even in the most recent publication of economic and social indicators on a national level dating from the 1950s to the year 2006, it is observed that environmental indicators still lag behind when far more important issues of income and production, investment and savings, foreign trade, banking, public finance³⁰ spheres are brought to the surface. It is possible to interpret that, despite the good will and intention of sustainability goals, there is a lack of political support for environmental information gathering. This can be linked to a fragmented institutional data capacity where a central database on environmental, institutional, economical and societal data, that are core to sustainability indicators, do not all co-exist under one roof. Moreover, it is imperative that a long term planning on data collection has to be inserted into the system of thought where these data are not only valid for an instantaneous point in time but continues on a time series scale. The current status of data in terms of indicators has been analyzed and represented across the three interlocking spheres of sustainability, as seen in Figure 4 below.



The above figure has been derived as a personal interpretation as a result of the relevant literature review that has been conducted on existing indicators in Turkey. It is most probably central to observe that even though economic and social data have been well gathered, the environmental data is limited. This can easily be justified from indicator studies by the SPO for example where environmental data have only been tied down to infrastructural data such as the capacity of facilities to provide drinking water.³¹ Regrettably, to this note, it has also been observed that data cross cutting dimensions of the interlocking spheres are severely lacking and need be improved to a great extent.

³⁰ State Planning Organisation (SPO), 2007

³¹ Dincer B., Özaslan M., Kavasoglu T., 2003

4.2.1. Institutional Perspective

To date, within a national context, gathering data to evaluate performance on environmental conditions and population and development, started in the 1980s.³² TURKSTAT (Turkish Statistical Institute), the organization held responsible for such studies, has attempted several studies targeting the coordination of statistics under the notion of Sustainable Development. With the National Environmental Action Plan (NEAP) that had been developed between 1995-1999 a “National and International Environment and Sustainable Development Indicators Report” had been published with the generation of several performance indicators to monitor progress.³³ However, it can be criticized that despite the great output of the National Environmental Action Plan, an indicator based progress monitoring has not been implemented. However, most recently, TURKSTAT has been undergoing an assessment within the institute itself to gather and round up all the possible data that could be categorized parallel to the themes of the EUROSTAT Sustainable Development Indicator Sets in order to evaluate how many of the EUROSTAT indicators the Turkish data sets can satisfy. The EUROSTAT Sustainable Development Indicators have been established with the aim of monitoring EU-wide sustainable development strategies within set 10 themes (economic development; poverty and social exclusion; ageing society; public health; climate change and energy; production and consumption patterns; management of natural resources; transport; good governance; and global partnership) and subsequently track overall political commitments towards achieving these set goals.³⁴

As a result of an informal interview conducted with several members of TURKSTAT, unofficial outputs of such a study by TURKSTAT reveal that the data gathered within the institution for these indicators are close to satisfying 35% of the EUROSTAT Indicators.³⁵ This percentage, of course, can be interpreted from two different aspects. Initially, it is a low range percentage to satisfy the general data/indicator requirements by the EU and needs to be improved at all levels. However, one can then also argue that rather than trying to merge national priorities on indicator measurement to those of the EU; it would be more reasonable to have a separate indicator set that would measure progress on the country needs according to national policies and priorities up front but still abiding to EU strategies. Hence, for future studies that are to be conducted in this respect, sustainable development indicator sets should be reflecting national needs according to pre-defined policy priorities yet still in line with international indicator sets to create a harmonized indicator strategy.

4.2.2. Academic Perspective

The academic world in Turkey, has gone into several indicator study attempts and the last example is one from the European Union Sixth Framework Programme, where a Turkish University (Middle East Technical University) has established a collaboration with several European Institutions and Universities to work on assessing sustainability in regions using indicators through system dynamics modeling.³⁶ The project intends to reveal a ‘system toolkit’ by making use of systems dynamics where

³² Yeşilhüyük G., 2005 pg3

³³ Yeşilhüyük G., 2005 pg3

³⁴ European Commission (EC), EUROSTAT home page, “Sustainable development indicators – Introduction”

³⁵ Personal Communication: Can, Ali and Tokel, Aynur (Personal Communication, February 12th, 2007)

³⁶ INSURE Project – EU Framework Programme 6, 2006

this can then be transmitted through to the policy makers, stakeholders researchers and consultants when developing future sustainable development policy options. This study is intended to be expanded and continued upon through the European Union seventh framework programme as well.

4.2.3. NGO and International Organization's Perspective

Reflecting upon the concept of sustainable development from a NGO and international institutions perspective, it can be said that they have been quite successful to date in raising awareness to enhancing popular level knowledge through pioneer projects to serving the broader goal of wide-spreading the notion of sustainable development. The Regional Environmental Center (REC) country office, which opened in 2004, for example, serves at capacity building through training programmes, within central and local governmental institutions, NGOs and other related stakeholders to be able to tackle environmental challenges effectively that Turkey faces.³⁷ The United Nations Development Programme (UNDP), a leading institution and a very close partner of the Turkish government, has initiated many projects that have led to great achievements with the expertise of UNDP in setting sustainable development as a global priority.³⁸ In this respect, a European Union funded project; "Integration of Sustainable Development into Sectoral Policies" has been initiated by United Nations Development Programme in the year 2005 with the beneficiary being the State Planning Organization to define prior and utmost sectors of importance to initiate capacity building on the notion of sustainable development within these example prior areas. Also the project aims at bringing together a number of initiatives on indicators to contribute to a national picture of the state of sustainability and enhanced use of sustainable development indicators by the public.

4.3 Turkey's Standing within International Indices

At this point, it is perhaps crucial to observe the current standing of Turkey within internationally known and accepted indices to evaluate overall sustainability and performance. As seen from the Table 1 below, Turkey falls in the mid-range category of all listings, be it from a GDP perspective, CO₂ emissions or meeting the requirement of the Millennium Development Goals set forth by the United Nations.

³⁷ The Regional Environmental Center, REC Turkey, 2005

³⁸ United Nations Development Programme (UNDP) – Turkey, 2006

INDEX	EXPLANATION	RANKING
Environmental Performance Index (EPI)	The Environmental Performance Index makes a general ranking of performance under the main policy categories of: Environmental Health, Air Quality, Water Resources, Productive Natural Resources, Biodiversity and Habitat and Sustainable Energy tracked using sixteen indicators. ³⁹	According to Pilot 2006 Environmental Performance Index , Turkey is in the 49th Place out of 133 countries (with a score of 72.8) where New Zealand is Ranked 1 st (with a score of 88.0) and Niger ranks last (with a score of 25.7) ⁴⁰
The Environmental Sustainability Index (ESI)	Tracks countries commitments to environmental sustainability under 21 categories with importance and effort given to environmental protection, environmental management and reflecting these upon policy categories. ⁴¹	In the 2005 Environmental Sustainability Index; Turkey is Ranked 91st among 146 countries (with a score of 46.6 where its peer group average (Countries whose GDP per capita (PPP)) ranges between \$5,869 - \$12,673 average is 52.1) ⁴²
The Human Development Index (HDI)	Measures counties' achievements in terms of development based on factors of life expectance, adult literacy and GDP per capita	Turkey is ranked 92nd out of 177 countries with an increasing HDI of 0.757 in comparison to Norway which is ranked first place with and HDI of 0.9685 ⁴³
The Ecological Footprint	Tracks the demand of human populations on the planet's ecosystems relative to the biologically productive land and available water ⁴⁴	In the Ecological footprint, Turkey is ranked 56th out of 141 Countries. With an ecological footprint of: 2.73 in comparison to United Arab Emirates which has the largest footprint of 15.99 and Bangladesh the least with 0.6 (the weighted average for all countries being 3.1) ⁴⁵ .
The (un)Happy Planet Index (HPI)	The HPI is an index designed contrary to the indices that measure human well being in terms of GDP but takes sustainability as the main center of approach and operationalizes the concept of well being around 'Happy Life Years' ⁴⁶	Turkey is ranked 98th among 178 countries (with an HPI of 41.40) in comparison to Vanuatu which ranks first (with 68.21) and Zimbabwe which ranks last (with 16.64) ⁴⁷
The "Millennium Development Goals (MDG) Dashboard"	The MDG Dashboard is a database that shows countries' overall assessments towards achieving the Millennium Development Goals	On the MDGs index Turkey has an overall ranking of 85th. ⁴⁸

Table 1. Turkey's standing within internationally renown indices

³⁹ Etsy D. C. et al., 2006

⁴⁰ Etsy D. C. et al., 2006

⁴¹ "2005 Environmental Sustainability Index Benchmarking National Environmental Stewardship Country Profiles", 2007

⁴² "2005 Environmental Sustainability Index Benchmarking National Environmental Stewardship Country Profiles", 2007

⁴³ United Nations Development Programme (UNDP), 2006 b, "Human Development Report 2006"

⁴⁴ Ecological Footprint and Biocapacity, 2006

⁴⁵ World Wide Fund for Nature (WWF), 2000, Living Planet Report

⁴⁶ Veenhoven R.,1996

⁴⁷ The New Economics Foundation, 2006, The (un)happy Planet Index

⁴⁸ Millennium Development Goals (MDG) *Dashboard Interactive Database*

5. PART II - Introduction to a Comparative Case Study

5.1 Background Information

Not necessarily being an indication of any sort, but simply to characterize a measured statistic; Turkey is ranked 20th by the International Monetary Fund⁴⁹ and 19th by the World Bank⁵⁰ in terms of the worlds leading nominal Gross Domestic Product according to 2005 data. Unfortunately, however, despite a high ranking in terms of GDP, the country faces great regional disparities within its geographic context. Great inequalities in the distribution of income and wealth remain, where the Marmara Region for example (where Istanbul is located), defined as the richest region, has been measured to be “four times as rich as the poorest region, Eastern Anatolia”.⁵¹ It is crucial at this point, that future policies in this direction be formulated in a way such that this immense regional disproportion is reduced to the minimum and concrete wealth equality be the main target, especially on the path of accession to the European Union. Although, Turkey’s GDP growth rate is well above the average of the European Union as seen in Table 2; GDP per capita remains well below the EU-15 average. However, unless regional imbalances are minimized, “dissatisfaction and unrest in the eastern and south-eastern provinces”⁵² are expected to linger. Hence the OECD has given special attention to Turkey’s Economic Performance under the heading of: “Turkey's challenges to achieving a sustainable catching-up”.⁵³

	TURKEY		EU-15
	2000	2005	2005
GDP (At current Prices, Billion Dollars)	200.0	363.4	12,757
GDP per Capita (At current Prices, Dollars)	2,879	5,042	33,517
GDP Growth (Real percentage change)	7.4	7.4	1.5

Table 2: GDP, GDP per Capita and GDP Growth Rate of Turkey in Comparison to EU-15⁵⁴

5.2 Modeling a City on the Path toward Sustainability

Numerous factors make up and contribute to defining a city or a province. However, redefining a city within the context of sustainability, formulates the concept around the characterization of a city that “needs to meet social, environmental, political and cultural objectives as well as economic and physical ones” according to Rogers.⁵⁵ Therefore, it can be widely accepted that when conceptualizing around city; a multi dimensional and comprehensive approach is imperative.

⁴⁹ International Monetary Fund (IMF), 2006, World Economic Outlook Database

⁵⁰ World Development Indicators database, World Bank, 2007

⁵¹ Sezer H., 2006 pg 357

⁵² Sezer H., 2006 pg 360

⁵³ Organisation for Economic Co-operation and Development (OECD), 2006

⁵⁴ State Planning Organisation (SPO), 2006 a

⁵⁵ Egger S., 2006 pg1239

It is also crucial to acknowledge, in this context, that cities should be regarded as dynamic entities in a sense that they have both an internal dynamics and an external dynamics. The internal dynamics of a city constitutes its ethnic diversity, its local population dynamics, its differing political vision, competitiveness among sectors along with many other variables; whereas the external factors of the city are vital for it to strategically position itself in the global competing arena. Therefore, as Egger describes it; “[c]ities must reconcile the conflict between being part of a competitive global city network and satisfying the day to day requirements of their own inhabitants.”⁵⁶

At this point, one of the major objectives of the city and similarly the objectives of the inhabitants that formulate the city is to strive for a higher quality of life and local development, to sustain this over long periods of time and endeavor to achieving higher standards in local, regional and global arenas.

In order to analyze a city and its possible trends that it might follow to achieving sustainability, all the variables that might effect to the overall local development and quality of life should be investigated with the possible inter-linkages and complex interactions that exist. In this respect, indicators that show changes on a spatial scale will be a meaningful tool to monitoring change with respect to time. With an in depth analysis through indicators, it could be possible for the public and decision makers to make an overall assessment to the prevailing conditions of the environment, economy and social well-being.⁵⁷ This way, a picture can also be painted to show how sustainable development has been delivered and perceived at the local level showing diversity among cities.⁵⁸

The starting point of the effort on trying to model a city and its achievement on the path toward sustainability is based on the most famous anecdote by George Box who believed that: “[E]ssentially all models are wrong, but some are useful.”⁵⁹ Also, as John Sterman approves: “[s]ystems thinking requires understanding that all models are wrong and humility about the limitations of our knowledge.”⁶⁰ Although, it is widely accepted that modeling through scenarios never predict the future since they are based solely on assumptions and predictions; they will, in fact, reveal a useful trend that sets path for a future option that can possibly take place. Different from traditional forecasts, scenarios help grasp complex interactions of numerous factors across temporal and spatial scales that help reduce several uncertainties that hinder future policy options and ‘good’ governance strategies.

In an overall context, this study will try to draw attention upon the different strategies of development on the path towards sustainability from the perspective of two provinces selected from two very differing regions. Thus two provinces, IZMIR from the highly developed Aegean Region and ERZURUM other from the lesser developed region of Eastern Anatolia have been selected. According to 2003 data, the Aegean Region is ranked as the second most developed out of the seven in the country, whereas the Eastern Anatolian Region is the least developed (Refer to Map 1).⁶¹

⁵⁶ Egger S., 2006 pg1239

⁵⁷ Hardi P., DeSouza-Huletey J.A., 2000 pg 59

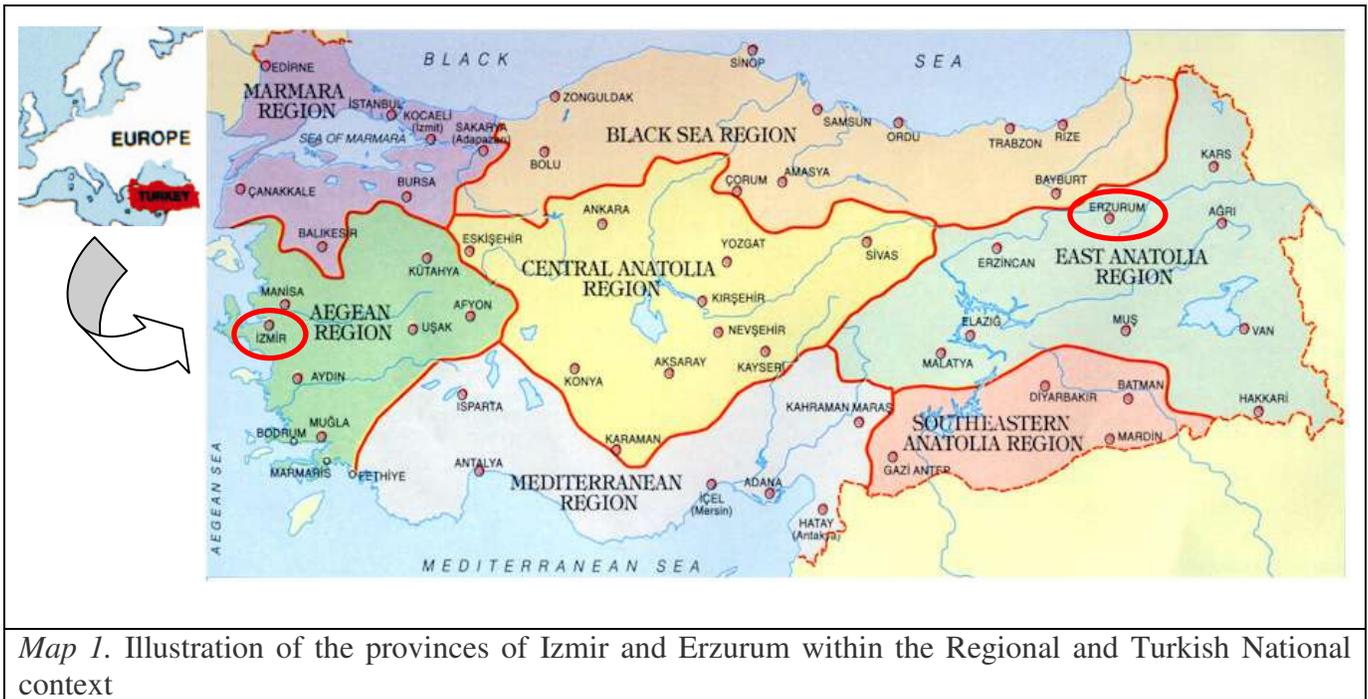
⁵⁸ Audit Commission, 2005

⁵⁹ Initially quoted in Box, G. E. P. and Norman R. D., 1987 p. 424

⁶⁰ Sterman J. D., 2002

⁶¹ State Planning Organization, 2003

From the previously conducted study of the State Planning Organization of the overall ‘socio-economic ranking research of provinces and regions’ an overall index had been derived for assessing the performance of provinces within Turkey based on the ‘Principle Component Analysis’ (PCA). The main objective of using the PCA is to bring together important variables that are rather uncorrelated and combine them under one factor (i.e. defining a common index that undertakes subsets of variables such as indicators that are not necessarily linked to one another).⁶² The main thematic categories that have been calculated within the index of the State Planning Organization are as follows: demographic indicators, employment indicators, education indicators, health indicators, industry indicators, agriculture indicators, structural indicators, financial indicators, infrastructure indicators, other welfare indicators.



As the result of the study that assesses social and economic indicators as the basic variables to the system, the province of Izmir is ranked 3rd out of 81 provinces (with a calculated index value of 2.52410), whereas Erzurum is ranked 60th out of 81 provinces (with an index value of -0.53286).⁶³ Hence, the results of this study also support the aforementioned problems of regional disparities within the country.

Despite setting forth two different development outcomes, several other factors have also been considered for the deliberate selection of these two provinces. Izmir and Erzurum tend to reveal two very different demographic patterns such that Izmir is ranked as one of the top most provinces of the country that receives ‘in migration’ from other regions; whereas Erzurum has a very high potential of ‘out migrants’ that leave the province to settle down in other parts of the country. For this reason,

⁶²McCuen R. H., 1992 pg 125

⁶³ Dincer B., Özaslan M., Kavasoglu T., 2003 pg 55

while Izmir stands as a receiver province of population with increasing demographic indicators, Erzurum is on the status of a donor province of population. Similarly, it is observed that despite many instances of intense investment in the province of Izmir, be it Foreign Direct Investment, Public Investment or Individual Investment; Erzurum unfortunately lags very behind on these values. Also, despite the vast opportunities that the western region of the country provides in terms of health, education, employment, accessibility; the eastern regions fall short of the expected.

5.3 Selection of Indicators for the STELLA Model

To make an overall and simple understanding of where the province of Izmir and Erzurum stands on the path towards sustainability with their current status and with future projections, a STELLA model has been designed to bring together complex interactions of the many variables. The modeling program STELLA, is renown as a leading software in systems thinking.⁶⁴ STELLA simulates variables in terms of stocks (a pool of an entity) and flows (a flow that pours into the pool), where it derives scenarios on a spatial timeline. Hence, future projections and their rates of changes can be forecasted for these stocks. In this respect, several variables have been selected (based on dominant activities in the region and simple data availability) to ultimately assess two key concerns under sustainable development: quality of life and local development. Indictors will provide the simple data to make such future projections possible with quite many interlinked variables.

The starting date of the model has been selected as the year 2000 based on the most recent available data and simple projections of all variables have been carried out until the year 2020. The major research that underlay the formulation of this STELLA Model is based on The State Planning Organization's (SPO) study that that measures several Economic and Social Indicators for all of the provinces and regions of Turkey (carried out for the two distinct years of 1996 and 2000 based on the population census'). The 'system boundaries' of the developed model have been designed to incorporate the province boundaries itself (but not the region) however; several influences of the region have been merged into the province features such as the climatic patterns. Although the scope of the boundaries taken into account can be expanded and elaborated upon indefinitely, the model has been limited down to the basic sectors that give the city its dynamics. The conceptualization has predominantly been gathered around the four main spheres of economic activities, social well being environmental considerations with the ideology of good governance, institutional sustainability and policy making as a common denominator to all.

5.4 Generation of Causal Loop Diagrams and Systems Thinking

Here; a mental model has been generated (as a form of representation of the problem), where interactions can be displayed to show how one might visualize how these variable's linkage to one another. A grid is created to indicate feedbacks where variables are linked to each other with causal links which are given positive or negative polarities. A positive polarity (+) indicates that the two variables are directly proportional (i.e. meaning that if there is an increase in one, the other one is expected to increase) and a negative value (-) means that the two variables are indirectly proportional (i.e. if one increases, the other is expected to decrease). The main themes that are to be analyzed within

⁶⁴ isee systems, inc. official website

the scope of the mental model and the subsequent indicators that compose them are illustrated in 3. The ultimate aim will be to assess the overall quality of life (and local development) for each province.

	Themes		Indicators that define the themes
Overall Quality of Life	Local Development	Education Opportunities	# of primary schools
			# of high schools
			# of high school teachers
			# of universities
		Health Care Opportunities	# of doctors
			# of dentists
			# of pharmacies
			# of beds in hospitals
		Accessibility	# of ports
			# of airports in the region
			% of asphalt roads
		Historic and Cultural Wealth	# of museums
			# of shows
			# of performances
			# of visitors
			# of attendances
		Efficiency of Urban Services	Population density
			# of vehicles
			# of city planning strategies
			Housing possibilities
		Tourism Dynamics	# of Tourists
	Investment in Tourism		
	Environmental Degradation	# of industrial facilities	
		Area occupied by industrial facilities	
		Rate of urbanization	
	Job opportunities	Investment in the region	
Investment in Agriculture			
Investment in Tourism			
Satisfaction of Life	GDP per Capita		
	# of Average Household		

Table 3: Themes and contribution of Indicators to assess overall quality of life

- Similarly, ‘Health Care Opportunities’ are expected to boost with increasing number of doctors, dentists, pharmacies and number of beds available in hospitals.
- ‘Accessibility’ is defined by the indicators that measure, number of ports that exist within the province, number of airports in the region and percentage of asphalt roads that improve accessibility conditions. A relative increase in any of the indicators is noted as a positive contribution and a probable increase in accessibility alternatives.
- ‘Historic and Cultural Wealth’ of the province is made up by the contribution of the number of museums, the number of visitors to these museums, the number of shows and performances that take place and the number of attendances to these shows.
- ‘Climate Conditions’ are a positive contribution in terms of attracting in-migrants and tourists to the province. Relatively, as the rate of in migration increases, the local population is expected to increase.
- The ‘rate of urbanization’, the ‘population density’ and the ‘numbers of vehicles’ are expected to increase as the number of local inhabitants rise. Relative increases in population density, number of vehicles and urbanization rate (all directly proportional to the increase of local population) will negatively impact the efficiency of overall urban services. These can take place either with a direct correlation through increasing traffic congestions, lack of availability of possible housing units or simply through a general overloaded population existence per available area. As the quality of overall urban services go down, the degree of incoming tourists and the rate of net migration to the province will fall since a degenerating system of services is likely to drive away any incoming persons and hence the negative reinforcement. However, well defined city or province planning strategies (designed to facilitate future trends and plans of the region) that aim to mitigate these negative factors will contribute positively to the efficiency of urban systems.
- ‘Job opportunities’, are expected to decrease with an increase of local population. Yet, investment coming into the region from sources of National Investment will straightforwardly increase job opportunities. Availability of job opportunities will relevantly reduce the degree of unemployment and simultaneously increase the diversity of the labor market.
- The ‘numbers of tourists’ that are expected in the region have also been linked to the contribution from factors such as general investment in tourism, accessibility, climate, historic and cultural wealth and efficiency of urban services. Eventually, the number of tourists and the investments that take place for tourism can illustrate how the tourism dynamics are to change with time.
- The ‘degree of environmental degradation’ has been linked to the overall growing industrial capacity of the region. As the areas allocated to industrial facilities increase and as the number of installed industrial facilities increase, their likelihood of causing adverse environmental effects are expected to be on the rise. The rate of high urbanization to compensate for the increasing local population is also expected to negatively influence environmental conditions.

5.4.2. Causalities for the Province of Erzurum

The Erzurum mental mapping format has been carried out quite similar to the Izmir Province with the only exception of the in-migration factor becoming an ‘out-migration’ aspect. The demographic dynamics nature of Erzurum, as a population donating province, is manipulated by the rate of net out-

host within its boundaries. On the other hand, if these same opportunities for the province of Erzurum also increase, then the rate of out migrants that the province donates will be on a decrease. So, with a province providing better opportunities, local inhabitants will prefer to stay in their home town rather than migrating outward. The inverse logic comes in where, one can question how Izmir's in migration is expected to rise simultaneously when Erzurum's out-migration level decreases. A simple explanation to this can be provided by the basic assumption that Izmir will attract migrants until a saturation point is achieved where in migration rate will level off and concurrently Erzurum will continue to donate local inhabitants outwards until a fulfilling level of opportunities is achieved and the our migration level will stabilize to a point where it reaches equilibrium. Hopefully, each equilibrium point that is achieved in each province will reveal the level of where SUSTAINABLE DEVELOPMENT has been attained.

6. Transferring Variables to the STELLA Model

The generated stocks and flows for transferring the variables from the mental models to the STELLA Software can be seen in the figures in the appendix.

6.1 Demographic Factors

6.1.1. Local Population

The local populations within the province boundaries have been obtained from the most recent national census carried out in the year 2000. The main contributors to the local population are the natural population inflow and out flow (generated by the net natural birth rate and death rate of the Izmir and Erzurum area) and the net rate of in or out migration that the Izmir Province receives or the Erzurum Province yields. The indicators used as input values for the STELLA model for demographics are as below in Table 4:

<i>Indicators</i>	UNIT	Izmir		Erzurum	
		<u>1996 value</u>	<u>2000 value</u>	<u>1996 value</u>	<u>2000 value</u>
Local Population	People	2978826	3370866	825581	937389
Natural Population birth rate			0.0228 {for urban cities}		0.035 {for rural cities}
Natural Population death rate			0.0062		0.0062

Table 4: Demographic Values used as input data to the model⁶⁵

6.1.2. In/Out migration

Since the 1950's there has been an increasing rate of in-migration within Turkey flowing from rural areas to urban and from underdeveloped regions of the country to the more developing.⁶⁶ Many of these in migrant flows have been linked to social and economic reasons, however; in addition to the

⁶⁵ Dinçer B., Özaslan M., Satılmış E., 1996; Dincer B., Özaslan M., Kavasoglu T., 2003

⁶⁶ Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü, 2006 pg 1

prevailing situation, security problems arising in the East and South Eastern Regions of the county due to terrorism, large scale development projects and natural disasters have also been effective in determining the rate of migration from the east to the west of the country.⁶⁷ The net rate of immigration to Izmir and the region is naturally dependent of several factors that attract migrants from other regions to the city. Within the scope of this model, the variables that affect the rate of immigration (as seen in Table 5) have been regarded as accessibility, education opportunities, health care opportunities job opportunities and climate. Hence, it is accepted that the increase of net in migration is directly proportional to these four factors.

IZMIR		
<i>Indicators</i>	Unit	1995-2000
Rate of Net migration	%o	39.9
Net Migration	People	120375

*Table 5: In migration values for Izmir*⁶⁸

Likewise, out migration from Erzurum to the more developed regions are linked to under established wealth conditions, lack of investment and shortage and limited number of opportunities in comparison to the more developed provinces. Current data of out migration for Erzurum are revealed in Table 6 below. When compared, the obvious difference between the two cities is apparent. Local development factors are subject to change as these numbers show variation.

ERZURUM		
<i>Indicators</i>	Unit	1995-2000
Rate of Net migration	%o	-54.8
Net Migration	People	-46491

*Table 6: Out migration values for Erzurum*⁶⁹

6.2 Public Investment

Province summaries for public investment data that have taken place as total amount of investment and in relevant sub-sectors such as agriculture and tourism have been gathered from the State Planning Organization from the year 2000 to the year 2006 (Refer to Table 9 and Table 10).⁷⁰ These data have been inserted into graphs of investment on a timeline scale and simple projections have been extended out until the year 2020. The data for after the year 2006 have been tracked similarly to those that the patters for the 2000-2006 period reveal.

⁶⁷ Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü, 2006 pg 1

⁶⁸ Turkish Statistical Insitutue (TURKSTAT), 2000 a

⁶⁹ Turkish Statistical Insitutue (TURKSTAT), 2000 a

⁷⁰ State Planning Organization (SPO), 2006 b

IZMIR				
	PROVINCE TOTAL	AGRICULTURE	TOURISM	
2000	186 098 867	3 889 002	856 001	Million TL
2001	206 307	4 248	216	Billion TL
2002	435 823	7 127	1 600	“
2003	499 918	2 213	3 500	“
2004	426 459	5 512	3 000	“
2005	527 533	17 700	6 300	Thousand YTL (Turkish New Lira)
2006	486 576	36 107	108	“

As of 24.04.2007
the currency
conversion of
1YTL ~
0.550947 EUR

Table 7: Sectoral Distribution of Public Investment within Izmir

ERZURUM				
	PROVINCE TOTAL	AGRICULTURE	TOURISM	
2000	34 814 908	3 325 000	112 000	Million TL
2001	59 938	3 590	215	Billion TL
2002	122 714	7 000	2	“
2003	135 310	14 254	2	“
2004	106 453	12 875	1	Thousand YTL (Turkish New Lira)
2005	153 266	14 032	50	“
2006	167 935	16 422	-	“

As of 24.04.2007
the currency
conversion of
1YTL ~
0.550947 EUR

Table 8: Sectoral Distribution of Public Investment within Erzurum

6.3 Job Opportunities / Unemployment

The rate and amount of investment in a province is straightforwardly expected to increase the availability of job opportunities and in relevance decrease the overall rate of unemployment in the region. Thus, as the rate of unemployment goes down from current percentages with all of the investments that are expected, overall diversity of the labor market should be on the rise. The geographic distribution of unemployment varies, but for these specific provinces the unemployment rates are as follows for the year 2000:⁷¹

Indicators	UNIT	Izmir	Erzurum
		2000 value	2000 value
Unemployment	%	9.2	4.7

Table 9: Unemployment percentages for the provinces of Izmir and Erzurum

6.4 Health Care Opportunities

Four indicators (# of Docs, # of Dentists, # of Pharmacies, # of beds in hospitals) have been selected under this theme as aforementioned in the mental map. The values of these stated indicators have been

⁷¹ Turkish Statistical Insitutue (TURKSTAT), 2000 b

measured previously by the State Planning Organization for the year 2000; hence the 2000 measured values have been the base point of reference and for this reason the starting point of the model. Calculating the **net rate of change** for each indicator is also necessary to see how these indicators show change with time to make relevant projections for the future years in developing scenarios. The net rate of change has been derived by using the difference of change in indicator values between the 1996 and 2000 measured values, since these are the only two years that have an available dataset on these indicator values.⁷²

The rates of change for each entity have been calculated by the ‘**Compound Interest**’ Phenomena. The main reason for the necessity of a compound interest calculation is that the rate of change is not only based upon the initial ‘stock’ value but builds upon the added change to the stock. The compound interest rate is defined as follows:

$FV = PV (1 + r)^t$	<i>Where:</i> FV= Future Value PV= Present Value r = Change rate (interest rate) t = Number of years
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Hence; in order to calculate the rate of change of any stock unit, the Future Value has been taken as the 2000 data available, the Present Value has been taken as the 1996 measured data and the number of years is therefore respectively been calculated as the difference between the years 2000 and 1996 to be four years.

$X_{2000} = X_{1996}(1+r)^t$	<i>Where:</i> X ₂₀₀₀ = Is the data for the year 2000 X ₁₉₉₆ = Is the data for the year 1996 r= Change rate t= Number of years (4 years)
------------------------------	---

So, in order to calculate the rate of change in the equation (r); the following rates of changes for the indicators have been calculated by inserting the known values for the rest of the equation (See Table 12 and Table 13).

Theme	Indicators	Unit	1996	2000
IZMIR Health Care Opportunities	# of Docs	Doctors	6133	7655
			$7655 = 6133 (1+r)^4; r = \mathbf{0.0569}$	
	# of Dentists	Dentists	846	1540
			$1540 = 846 (1+r)^4; r = \mathbf{0.161}$	
	# of Pharmacies	Pharmacies	1206	1594
			$1594 = 1206 (1+r)^4; r = \mathbf{0.072}$	
	# of beds in hospitals	Beds	8460	9779
		$9779 = 8460 (1+r)^4; r = \mathbf{0.037}$		

Table 10: Health Care Indicators and Rates of Change for Izmir

⁷² Dinçer B., Özasan M., Satılmış E., 1996; Dincer B., Özasan M., Kavasoglu T., 2003

Theme	Indicators	Unit	1996	2000
ERZURUM Health Care Opportunities	# of Docs	Doctors	699	1153
			1153 = 669 (1+r) ⁴ ; r = 0.133	
	# of Dentists	Dentists	106	49
			49 = 106 (1+r) ⁴ ; r = -0.175	
	# of Pharmacies	Pharmacies	78	94
			94 = 78 (1+r) ⁴ ; r = 0.0478	
# of beds in hospitals	Beds	2262	2965	
		2965 = 2262 (1+r) ⁴ ; r = 0.06999		

Table 11: Health Care Indicators and Rates of Change for Erzurum

This calculated rate of change is then assumed to be the starting point of the rate of change from the year 2000 and onward. However; where necessary, the rates have been calibrated on the timeline to reveal realistic outcomes.

6.5 Education Opportunities

A lot of variables may contribute to the definition of what constitutes education. Within the scope of this model; the number of primary schools, the number of high schools, the number of high school teachers and the number of universities found in the province have been the main criteria in evaluating education opportunities. Data for education for the province of Izmir⁷³ and Erzurum⁷⁴ have been gathered from relevant province governorships web data. The relevant number of the defined indicators and their rate of increase has been defined and calculated as follows:

Indicators	UNIT	Izmir	Erzurum
		2000 value	2000 value
Primary Schools	Primary schools	1231	1079
Primary Schools Increase Rate		0.00322	
High Schools	High schools	95	86
High Schools Rate		0.165	
High School Teachers		4094	715
High School Teachers Rate	High School teachers	0.0979	0.0979
Universities* (Number of universities have been assumed to remain constant within the scope of the model until 2020)		5	1

Table 12: Education Indicators and Rates of Change for Izmir and Erzurum

6.6 Accessibility

Accessibility has been considered to be of great importance in contributing to the level of in or out migration, the ease of attracting tourists to the region and assisting to overall quality of life driven in

⁷³ Governorship of Izmir Official Website

⁷⁴ Governorship of Erzurum Official Website

the region. The indicators that are regarded as a sub theme to accessibility are; the number of airports in the region, the number of ports and the % of asphalt roads that provide easy access to and from the province. Hence, the better the overall logistics and facilities, the more they are considered to contribute positively to local development. Here, the characteristics of being an urban or a rural area is naturally influential in providing easier access to the region of concern; thus, since it is considered that urban areas have had more infrastructural investment, they should logically be revealing better accessibility options. The numerical values that have been inserted into the Stella Model for accessibility indicators have been put in as static values (placed on an adjustable scale that can be corrected relevantly to changing conditions) and not as a stock. They have been regarded as constant values, and the two provinces data values have been assigned relative to one another. These values have been inserted on a scale of 1 to 10 and should there be a change of value, the numbers are adjusted accordingly.

Indicators	UNIT	Izmir	Erzurum
		<u>2000 value</u>	<u>2000 value</u>
ACCESSIBILITY			
Airports in Region	Airports	3	1
Number of Ports	Ports	1	0
% asphalt	%	97.49	74.63 ⁷⁵

Table 13: Accessibility Indicators for Izmir and Erzurum

6.7 Climate

Izmir is renown for its remarkably mild Aegean climate where the winters are smooth and sunny days are indispensable during the summer. Erzurum, on the other hand, faces severe winter conditions, where snow stays on an average of 114 days on the ground⁷⁶ and the topographic conditions contribute to the severity of the climate. The values for climate have been assigned relative to one another with respect to the number of clear and sunny days observed in each province as seen in Table 16.

Months	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<i>Total</i>
ERZURUM													
Ave. Number of clear Days	4	4	6	4	4	10	15	17	16	10	7	4	101
IZMIR													
Ave. Number of clear Days	8	8	8	6	11	19	24	23	18	15	10	5	155

Table 14: Average Number of Clear days observed in Erzurum and Izmir⁷⁷

Thus, on the relative scale, if the highest number of clear days is 10 (being best on the scale), Izmir can be assigned a value of 9 (since it is known to be one of the regions which the maximum number of clear and sunny days in Turkey) and Erzurum a relative value of 4 to be calculated for its contribution to the model.

Indicators	UNIT	Izmir	Erzurum
Climate	(on a relative scale between 0-10)	9	4

Table 15: Climate Indicators for Izmir and Erzurum

⁷⁵ Dincer B., Özasan M., Kavasoglu T., 2003

⁷⁶ Governorship of Erzurum Official Website

⁷⁷ Ministry of Culture and Tourism, 2005

6.8 Historic and Cultural Wealth

The historic and cultural wealth of a province is usually considered as the most significant feature in defining the essence of the region. Apart from contributing to the main cultural identity of the region; measuring historic and cultural wealth gives an idea on the diversity, the richness and the attractiveness of the area. This, relevantly, is one of the indicators that is expected to draw tourists to the region. Measuring historic and cultural wealth have been limited to the number of museums, visitors, shows, performances and overall attendances despite the fact that it can be extended upon to many other indicators. However, due to lack of availability of data and complexity, this theme has been narrowed down solely to these indicators. The data for historic and cultural indicators have also been inserted into a scale to measure relativity in comparison to one another.

Indicators	UNIT	Izmir	Erzurum
		<u>2000 value</u>	<u>2000 value</u>
Historic and Cultural Wealth			
# of museums	Museums	9	5
# of visitors	Visitors	277275	68516
# of shows	Shows	39	5
# of performances	Performances	952	161
Attendances	People	165672	32214

*Table 16: Historic and Cultural Wealth Indicators for Izmir and Erzurum*⁷⁸

(Due to a lack of availability for the year 2000, the 2002-2003 vales for all the above indicators have been used in place of the year 2000 values)

6.9 Tourist Population

Tourism, being one of the utmost income factors of Turkey, has a great significance in the country; such that in the year 2005, income obtained from tourism reached 18.1 million dollars.⁷⁹ With such a central sector at hand, tourism investments and attraction of tourist population is of extreme importance. For this reason, it has been considered as a separate variable in the dynamics of the system. The rate of increase of tourist population has been connected to the historic and cultural wealth of the province, climate conditions, accessibility, the efficiency of the services that the province provides, and the overall investment that is made in tourism (tourism facilities, increase of capacity, provided services). With such interlinking factors, number of tourists for the year 2000 is as follows with their overall increase rate:

Indicators	UNIT	Izmir	Erzurum
		<u>2000 value</u>	<u>2000 value</u>
Number of tourists	Tourists	620026	153382
Tourists Increase Rate		0.072	0.02

Table 17: Tourism Indicators for Izmir and Erzurum

⁷⁸ Turkish Statistical Institute (TURKSTAT), 2003

⁷⁹ NTV-MSNBC, 2006

Despite the fact that in Erzurum, the number of tourist increase rate is significantly lower than that of Izmir, it is assumed to increase notably since the Winter Universiade (the international sporting event for university athletes) is planned to be held in Erzurum for the year 2011. For this reason, major investments in the region in terms of hosting such an occasion is to be carried out, relevantly becoming alluring for hosting tourists with its slogan ‘Let’s meet on the Anatolian Peak’.

6.10 Efficiency of Urban Services

Naturally, the definition of quality of life in a city/province/country can be linked to the overall quality of the services that that place can offer at hand. What actually is meant by services provided can be extended indefinitely; however, here, it is considered as the possibility of housing opportunities provided, the probability of traffic congestion that might cause distress, the population density (hence the space availability per capita) and well defined city planning strategies that is aimed at improving quality of life in the future, specialized to that area/province. In this perspective, the number of vehicles and their increase rate in the future have been evaluated upon. Population density has been projected over the years in relation to the increase of the local population. Housing possibilities have been directly correlated to the rate of urbanization and the increase of population. These can be summarized in the table below (initial values have been taken from the SPO’s study):⁸⁰

Indicators	UNIT	Izmir		Erzurum	
		1996 value	2000 value	1996 value	2000 value
Vehicles	Vehicles	218050	332367	15851	21654
Vehicles increase rate		$332367 = 218050 (1+r)^4$; $r = 0.111$		$21654 = 15851 (1+r)^4$; $r = 0.0811$	
Number of Houses	Houses	131909	1140731	6948	117810
Housing inc rate		$1140731 = 131909 (1+r)^4$; $r = 0.715$		$117810 = 6948 (1+r)^4$; $r = 1.02$	
Urbanization Rate	%	79.22	81.07	47.20	59.80
Increase Rate of Urbanization		$81.07 = 79.22 (1+r)^4$; $r = 0.00578$		$59.80 = 47.20 (1+r)^4$; $r = 0.0609$	
Area of Province	km ²	12000		25066	
Pop density	Cap/km ²	Local Pop/12000		Local Pop/25066	
Number of City Planning Strategies	City planning strategies	5		1	

Table 18: Indicators of Urban Services for Izmir and Erzurum

6.11 Industrialization and Overall Environmental Conditions

The level of CO₂ emissions and their contribution to climate change has unfortunately not been tracked on a province-wide level and is still measured on a nation wide scale. To this reason, this factor has been eliminated in the comparative case study between Izmir and Erzurum. However, the number of industrial facilities and the area that they occupy have been selected as key indicators that might be the means in contributing to overall environmental degradation. Izmir, being highly industrialized and the

⁸⁰ Dinçer B., Öztaşlan M., Satılmış E., 1996; Dincer B., Öztaşlan M., Kavasoglu T., 2003

trade sector being among the dominant sectors, is seen to have a higher impact in contributing to overall environmental degradation; whereas Erzurum mostly dominated by agriculture and animal husbandry has a position in the rather lower scale in contributing through industrial development.

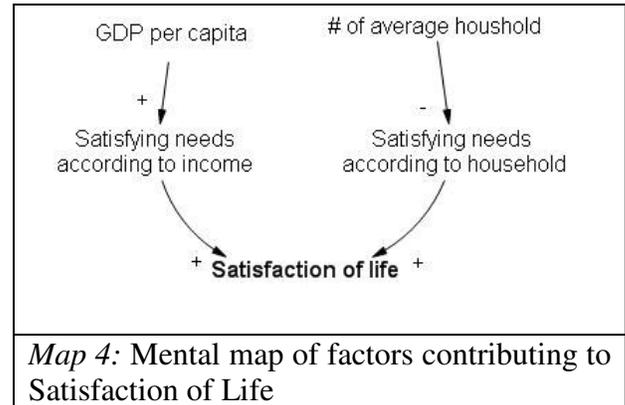
Indicators	UNIT	Izmir		Erzurum	
		1996 value	2000 value	1996 value	2000 value
Area Occupied by industrial Facilities	Parcels	632	1252	77	88
Net Rate of Increase		1252 = 632 (1+r) ⁴ ; r =0.186		88 = 77 (1+r) ⁴ ; r =0.0339	
Number of Industrial Facilities	Industrial facilities		1183		81
Urbanization Rate	%	79.22	81.07	47.20	59.80

*Table 19: Indicators of Environmental Degradation for Izmir and Erzurum*⁸¹

Contributions to overall environmental degradation have only been limited to industrialization and rate of urbanization because of the lack of availability of measured environmental data as indicators.

6.12 Satisfaction of Life

Satisfaction of life within the modeled provinces of Izmir and Erzurum has also been evaluated within a dynamics of its own. The two main indicators that have been considered to contribute to the definition of satisfaction of life have been regarded as GDP per capita and number of average household. According to a ‘Satisfaction of Life research’ conducted by TURKSTAT in the year 2005⁸², the following two tables have been generated as a result of nation wide surveys from a sample population. Hence, if the GDP per capita and Number of household are tracked for each province over the years, then their probability of satisfying needs and hence their satisfaction of life can also be projected upon.



Satisfying Needs According to Household Monthly Income							%
Household Monthly Income	Total	Very Hard	Hard	Medium	Easy	Very Easy	
Total (YTL)	100	25.5	30.7	34.2	8.4	1.2	
0-350	100	53.5	34.1	11	0.6	0.8	
351-560	100	27.9	38.5	29	4.6	0	
561-780	100	22.2	31.2	42.2	4.4	0.1	
781-1075	100	11.8	28.9	47.9	9.9	1.5	
1076-1580	100	10	22.2	48.6	16.4	2.8	
1581+	100	2.7	11	44.8	35.4	6.1	

Table 20: Ranking of satisfaction of needs according to household monthly income

⁸¹ Dinçer B., Öztaşlan M., Satılmış E., 1996; Dincer B., Öztaşlan M., Kavasoglu T., 2003

⁸² Turkish Statistical Institute (TURKSTAT), 2005

Satisfying Needs According to Number of People in Household						%
Number of people per household	Total	Very Hard	Hard	Medium	Easy	Very Easy
Total	100	1.2	9.1	36	30.4	23.3
1 to 2	100	16.3	28.8	37.6	14.3	3
3 to 4	100	20.1	29.6	38.8	10.6	0.9
5 to 6	100	27.9	30.8	35.2	5.1	1
7 to 9	100	33.5	30.9	29.6	5.5	0.6
10+	100	33.5	44.4	17.1	5	0.6

Table 21: Ranking of satisfaction of needs according to number of people in household

So, in respect to tables 22 and 23, it is seen that that the higher the GDP per capita, the easier it is to satisfy needs. However, if the number of persons per household increase, satisfying needs become harder and so are inversely correlated.

Indicators	UNIT	Izmir	Erzurum
		<u>2000 value</u>	<u>2000 value</u>
GDP/capita	Million TL (or equivalently YTL)	2696	914
Number of average household	People	3.58	5.73

Table 22: Indicators of satisfaction of life in Izmir and Erzurum

It is observed from the indicators tracked in the year 2000 that Izmir seems to be above the highest category of income per capita, satisfying needs according to income much easier than in the case of Erzurum which shows much harder satisfaction standards. Similarly, Izmir displays easier satisfaction of needs in comparison to Erzurum with a lower number of average household. However, it is crucial to observe how satisfaction of life standards is expected to increase with more investment in the Erzurum Province and relatively with a higher GDP per capita projection for the future. Also, with lower number of average households in the province of Erzurum, as prevailing housing and quality of life situations are anticipated to increase, satisfying needs according to average household are also expected to be on the rise.

7. Measuring Local Development and Overall Quality of Life (QoL)

Measuring quality of life has long been an issue of debate to measure overall progress of social well being. On one hand, it is subject to broad range criticism that the concept as a whole is “too general to be useful”⁸³ and that ‘quality of life’ being a composite indicator nests too many sub themes and indicators within itself that should be dealt separately as individual entities.⁸⁴ Or lately, the term ‘quality of life’ within itself has been reduced to simple terms with rather simple indicators that have been tied to it, such as, the sole measurement of GDP per capita. The Nobel laureate, Amartya Sen, has

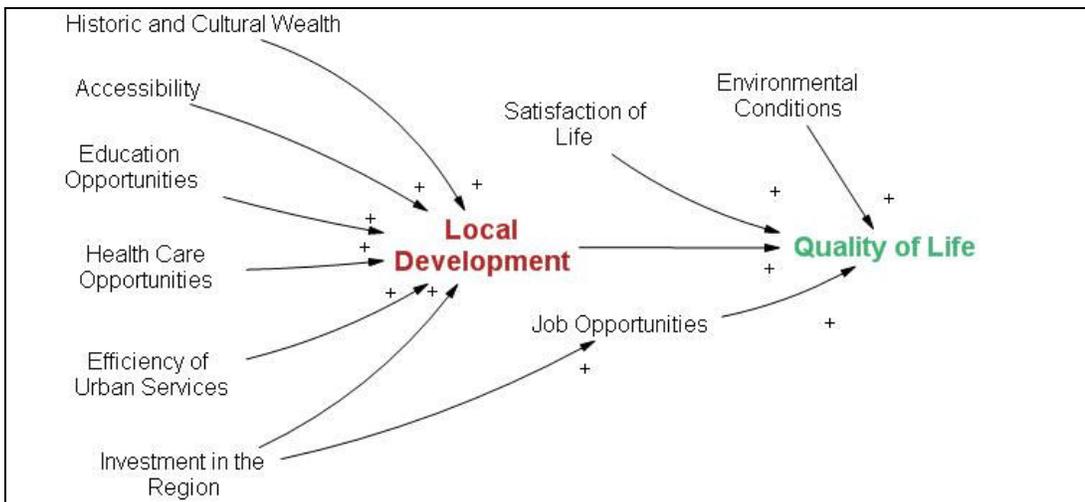
⁸³ Hagerty M. R. and Land K. C., 2006 pg 4

⁸⁴ Hagerty M. R. and Land K. C., 2006 pg 4

also drawn attention to this where he argues that single visions like “the capacity to purchase commodities”⁸⁵ (which could be interpreted as relative income or GDP) to assess a multiple perspective issue such as quality of life, does not successfully evaluate the issue as a whole and rather the consideration of many indicators are needed.⁸⁶ Hence, it should be quite acknowledged that a multi perspective issue can not be perceived from a single dimension.

However, it has also been argued that, despite the difficulties of combining all these multiple perspective indicators under a single common denominator of ‘quality of life’, individuals tend to do so when judgments regarding social decisions need to be taken.⁸⁷ This, for example, emerges when people make decisions on moving or changing location (“Is the QoL of one state higher than my current residence?”)⁸⁸ which is a very important factor that this model takes as a basis.

Therefore, despite the criticism, this model tries to assess the overall quality of life within a province since it is quite essential to illustrate a multiple perspective phenomena that has a very immense contribution to changing demographic values of in and out migration. The following links have been considered to contribute to Local Development and overall Quality of Life



Map 5. Variables that define Local Development and Overall Quality of Life

Measuring both quality of life and local development will give policy makers some sense of conceptualization of the contributing factors (despite the limited scope within this modeling scenario) and lead to an opening for discussions to guiding them on how the well being of the people can be perceived, where they need to intervene and redefine priorities or allocate necessary budget from this point on and forward.⁸⁹

⁸⁵ Cobb C. W., 2000 pg 16

⁸⁶ Cobb C. W., 2000pg 16

⁸⁷ Hagerty M. R. and Land K. C., 2006 pg 5

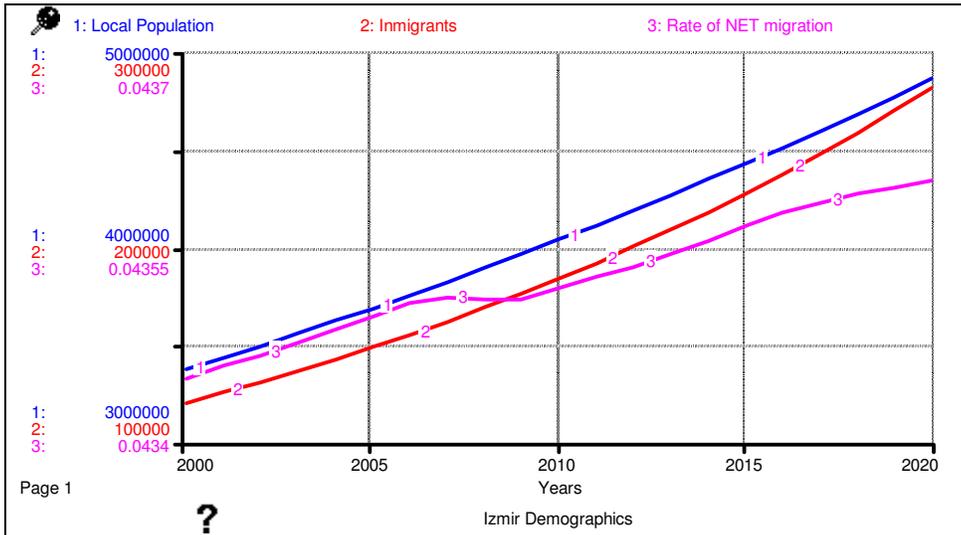
⁸⁸ Hagerty M. R. and Land K. C., 2006 pg 5

⁸⁹ Hagerty M. R. and Land K. C., 2006 pg 5

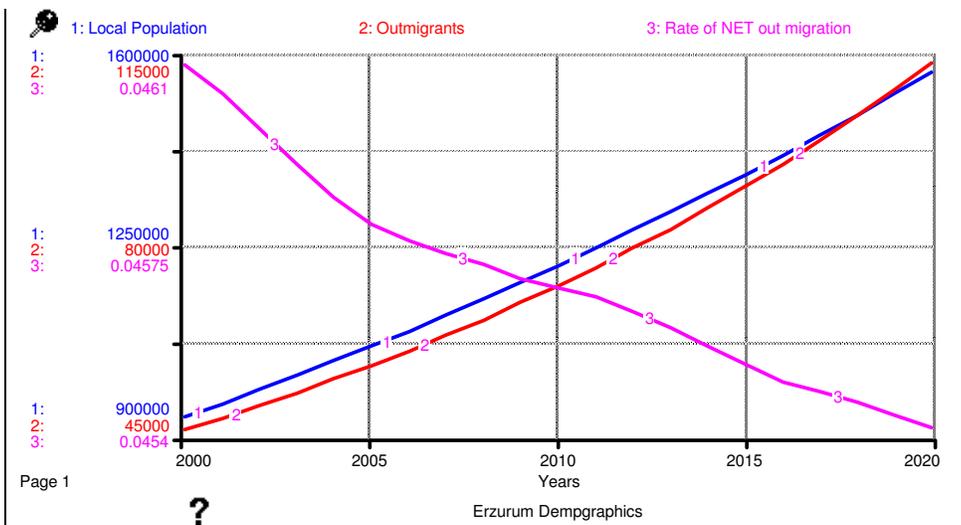
8. Results and Analysis

8.1 Results and Analysis of Stella Model Runs

After all the data have been entered into the stock and flow schemes of the STELLA Model, the two following graphs have been obtained for demographic trends for Izmir and Erzurum



Graph 1. Results of Demographics for Izmir

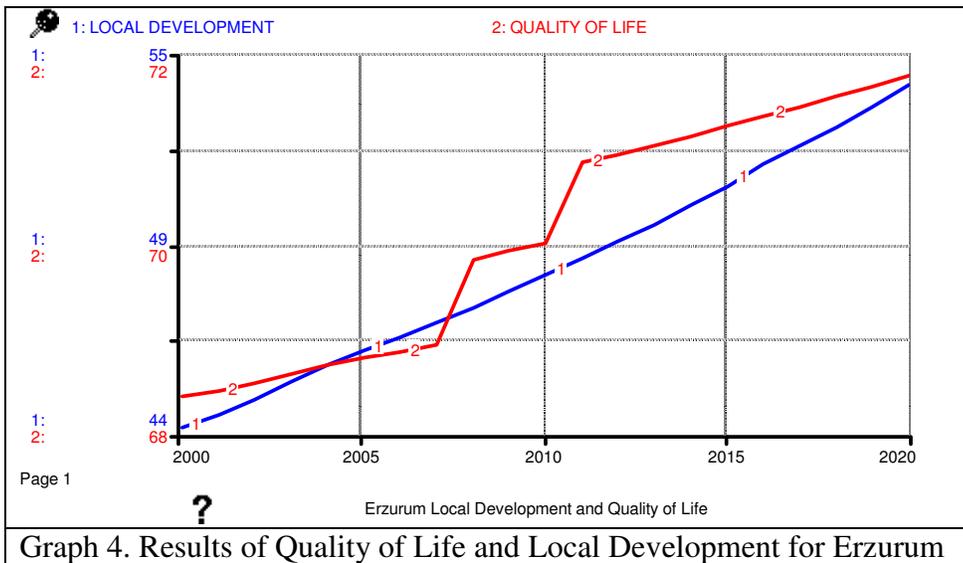
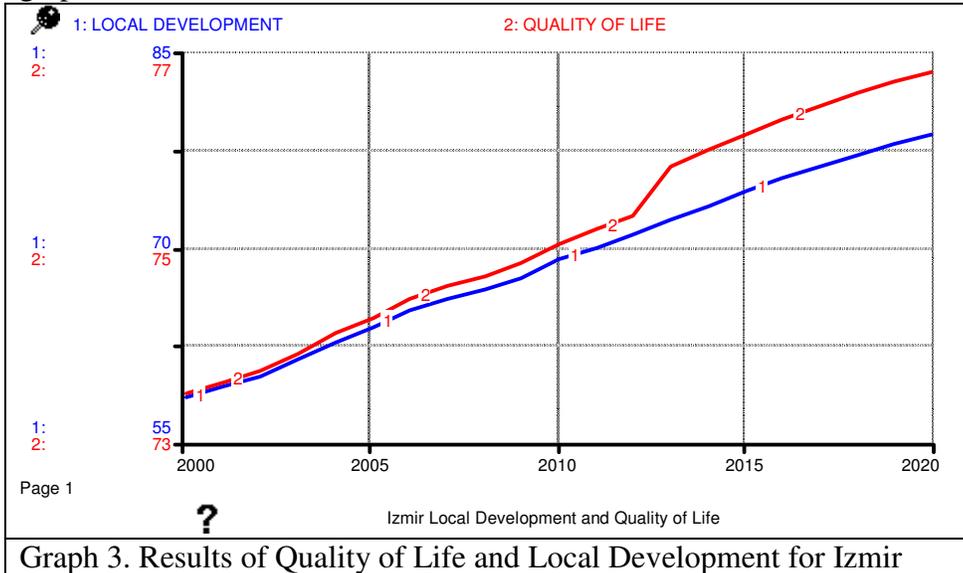


Graph 2. Results of Demographics for Erzurum

Within the run time of the model until the year 2020, the output graphs of the two models for demographics reveal that the population for Izmir is expected to rise to 4,871,124 (from 3,370,866) and that of Erzurum to 1,568,493 (from 937,389). The in-migrants in Izmir are expected to rise to 282,264 from 120,395 and the number of out migrants in Erzurum is to increase to 113,644 from 46,491. The rates of in migration and out migration vary, however, as expected, the rate of in migration in Izmir is increasing since predominant conditions advance, and on the other hand, as the prevailing situations in Erzurum become more appealing with improving overall conditions, out migration rate is on the decline.

8.2 Results of Quality of Life and Local Development

As the final output of the model and in line with the ultimate goal; the changes in the quality of life and local development have been observed over the two provinces within a span of twenty years as seen in graphs 3 and 4.



Thus, when observed on a scale of 0 too 100, the overall changes of the provinces reveal the following results:

	Local Development		QUALITY OF LIFE	
	2000	2020	2000	2020
IZMIR	58	79	73	77
ERZURUM	44	54	68	71

Within the province of Izmir, the quality of life shows an increase of 4 units rising from 73 to 77 whereas Erzurum shows a 3 unit increase to rise to 68 from an initial value of 71. These values are, of course, relative on a scale of 100; however, they are rather simplistic yet somewhat realistic conceptualizations of how overall quality of life is expected to show trends of change. It is crucial to recognize however that the themes that all contribute to increasing quality of life will show differences among the provinces, hence their rationale of increase can not be linked to the same reasons. In Erzurum for example, an increase in a quality of life is expected where environmental degradation is kept minimal and development is expected based more on agricultural incentives, animal husbandry rather than major investments in large scale industrial facilities and commercial activities that could contribute largely to this degradation. Job opportunities are thus satisfied through investments in other sectors other than industrial activities. In Erzurum, satisfaction of life might be set as a drawback since, number of average household and GDP per capita rank on the lower range of the scale; however, with the betterment of conditions, all are expected to be on the rise. When the graphs are analyzed, it can be seen that the quality of life shows a high increase rate between the periods of 2007-2011 for Erzurum. This can be linked to the high amounts of investments that are likely to take place in the region due the University Winter Olympics that are going to be held in Erzurum in 2011; thus in return increasing job opportunities. In Izmir, nevertheless, an increase of quality of life is expected due to increasing job opportunities with a very high rate of commercial trade and industrial investment dominant in the region; however environmental drawbacks will limit the overall contribution to the quality of life. Similarly, when local development trends are analyzed, a 10 unit increase is expected in Erzurum from 44 to 54, whereas local development shows 21 units of increase from 58 to 79 in Izmir. The factors contributing to local development show different trends among the years for two of the provinces. All the main themes that contribute to the quality of life being accessibility, education opportunities, efficiency of urban services, health care and quality of life are plotted on the output graphs in the Appendix. Within the health care indicators, it is seen that all indicators (# of Docs, # of Dentists, # of Pharmacies, # of beds in hospitals) are on an increasing trend at different rates however. Similarly, education indicators (# primary schools, # of high schools and # of high schools teachers) are on the rise. When the urban services of the provinces are analyzed, it is possible to observe that there seems to be a high drop in the efficiency of urban services between the years of 2006 and 2008 for Izmir; whereas in Erzurum the decrease of efficiency of urban services seems to be steady with a rather low rate of decrease. When planning strategies for future investment options, it is thus crucial to keep track of such changes. *Tourism dynamics* show parallel trends to the rate of investment in tourism in the province. The results of the *urbanization* graphs show how, with an increase in the housing units to cover for the increase in population, the ultimate indicator of capita per homes is on a decline. One of the most crucial factors to observe at this point is the rate of urbanization. It is seen that the rate of urbanization does not exceed 75% in Erzurum, whereas this percentage is close to saturation around 95% in Izmir showing the greatest difference of which region is characterized as urban or rural. When *employment* rates are analyzed, core to defining the quality of life, it can be observed that the initial rate of unemployment in Izmir is more than twice that of Erzurum. This can be linked to factors such as to the rate of urbanization and the high rate of in-migrants who migrate to the province with high expectancies of job opportunities that are usually not fulfilled. However, in both provinces, the unemployment rate is on the drop in parallel to the increase of investment in the region whilst job opportunity levels rise.

Within the scope of this model, *environmental conditions* and overall degradation has only been linked to industrial activities by the number of industrial facilities, by the area that they cover and to the rates of urbanization. Realistically, these are not the sole indicators that contribute to prevailing environmental conditions; however, due to a lack of data availability on a provincial scale, the output has only been limited to these indicators. Thus; the more the number of facilities and the greater the area that they occupy; the larger the overall contribution to environmental degradation is expected, as seen in the case of Izmir. *Satisfaction of needs*, as previously explained, has been linked to average number of households and to GDP per capita. Izmir already places itself on the higher range of this scale from its initial values, but as seen from the output graphs for Erzurum, with increasing overall conditions, Erzurum is to face a stepwise increase in the satisfaction of needs with time.

9. Discussion

Overall, as illustrated with the results of the projections of the two provinces, indicators should be regarded as very important tools that are likely to give guidance on future course of events and these are great examples that should act as early warning systems. In such cases, one could interpret that indicators take on the role of **precautionary principles** so as to set direction for better decision making, investing in priority areas and where necessary proposing alternative strategies to alter dominant prevailing negative conditions. However, it should also be noted that, indicators must be developed to fit country specific conditions moreover, even region specific circumstances since priorities show spatial variation. They have to be flexible but realistic, reflecting upon the priorities and needs of that specific region. Thus, from this point on, it can be interpreted that separate strategies need be defined to improve overall conditions both in terms of quality of life and local development for Izmir and Erzurum separately as set forward by the results of the model.

At this point Özkaynak draws attention to the fact that rather than elaborating upon the concept of ‘sustainable cities’ it is more important to highlight the fact of whether cities “move toward or away from sustainability.”⁹⁰ As seen from the quality of life and local development graphs of the provinces of Erzurum and Izmir, rather than selecting the trend on which is the better path to follow, one should evaluate each separately within their own boundaries. As said, the two provinces illustrate very different characteristics and bear very different attributes, so a ‘one size fits all’ approach would utmost be incorrect. Rather, it would be best to analyze sustainability achievements within each province dynamics. Ultimately, the priorities that need to be focused upon for each province might be entirely different but just as valid so as to define whether they are moving toward or away from sustainability or show trends of weak or strong sustainability. However, it is possible to derive the basic conclusion that each province has embraced a sustainability approach unique to prevailing conditions that reveal quite *optimistic* outcomes in their own way.

Addressing the original research question of where top down national strategies intersect with local bottom up sustainability approaches is crucial. It has already been underlined that a single set of indicators or an index is quite far from reaching the objective of capturing the overall picture and trend toward sustainability. However, setting national targets for reaching sustainability principles at the core and measuring success with a common sustainable development indicator set with national priorities

⁹⁰ Özkaynak Ortaköylüoğlu B., 2005 pg 36

should of course be an overall objective for future development and planning policies. Though, while developing national strategies in this intended pathway, local priorities must be consulted upon, if ultimate success at the national level and the global arena is desired. In a sense, this study has tried to bring forth local areas of priority that need attention on the provincial scale with the guidance of indicators projected into future scenarios. With these outputs it would then be possible to redefine planning strategies around economic, social, environmental concerns coherent to national governance policies that take current trends and results of local indicator projections into consideration. Hence, unique to each location, each result of local modeling that reveals areas of investment that need priority, should be brought up on the national agenda while planning on sustainable development strategies.

Nevertheless, Alex MacGillivray, has noted that we are still too early at a stage to see “spectacular results” from the success of monitoring indicators; however it is a good beginning and a great way of building “social capital” that is an utmost feature of dragging civil society engagement into the issue of concern.⁹¹ Thus, the new motto in line with such an engagement should be ‘bowling together’, rather than ‘bowling alone’⁹² and ultimately establishing a participatory framework.

10. Conclusion and Recommendations

Ultimately, modeling around the provinces of Izmir and Erzurum have revealed different end results, highlighting the root causes that need to be improved on the way to achieving sustainability on a provincial scale. If such an analysis is conducted on the 81 provinces of Turkey, then each priority area of each province will come forth. Ultimately, bringing together the 81 pieces of the puzzle, represented by the 81 provinces of the nation, would make it be possible to redefine national strategies on the ultimate goal to sustainability. A future research possibility to expand upon such an analysis, not to be limited to only these two chosen provinces, is indeed possible. Of course, expanding upon and making a further in depth analysis of the variables that all contribute to the derivation on such a model is also promising in order to have a better understanding of the systems dynamics with a more encompassing vision. In the end, with the systems dynamics framework, the indicator outputs will supply continuous guidance during the preparatory stage of formulating national strategies on sustainable development. Up till now, it has been observed that the main development paradigm has followed the traditional pattern of the preparation of development plans and the strategies that have been presented have predominantly taken their place in the economic and social spheres. However the main suggestion to be set forth as of this point should be that sustainable development plans and strategies replace the customary development plans to endorse and all embracing approach.

⁹¹ MacGillivray A., 1998 pg 94

⁹² In reference to Robert Putnam’s definition of Social Isolation in the US referred to as Bowling Alone, Putnam, R., 2006

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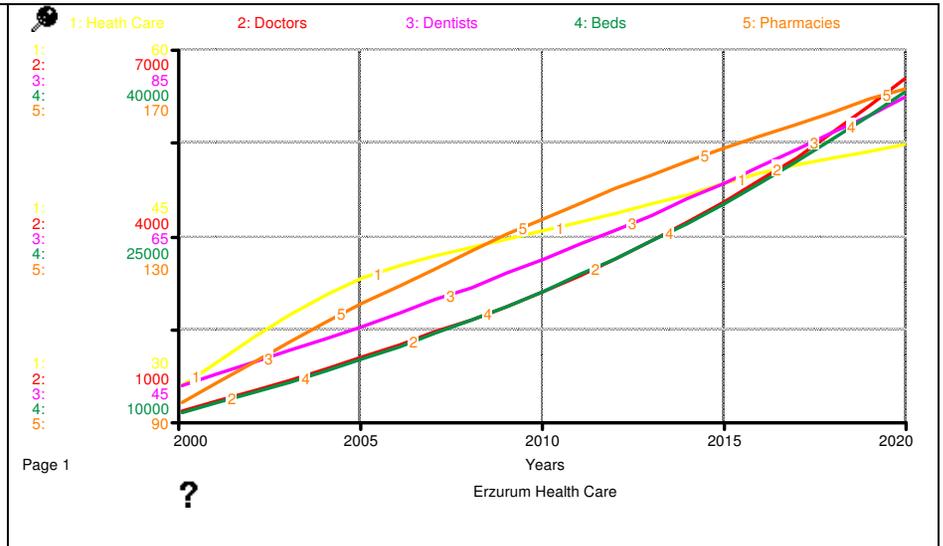
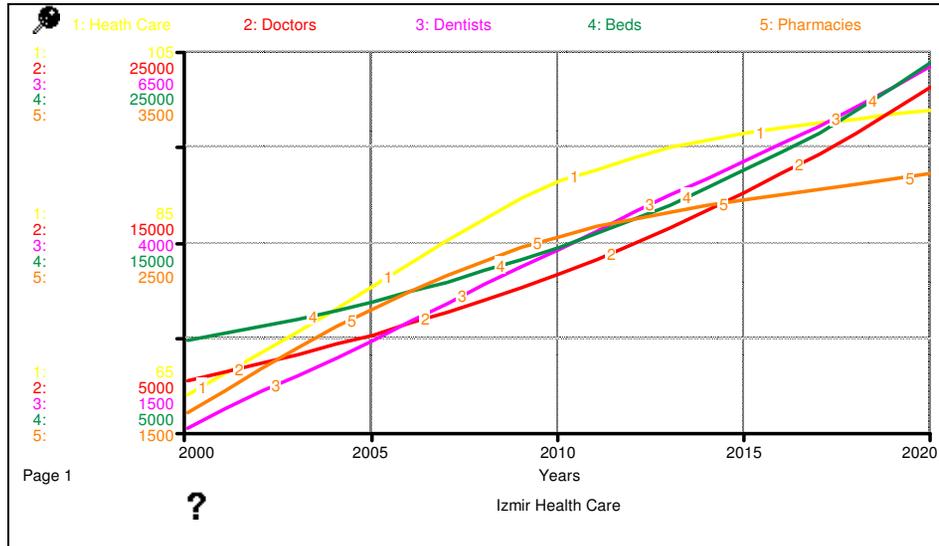
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APPENDIX

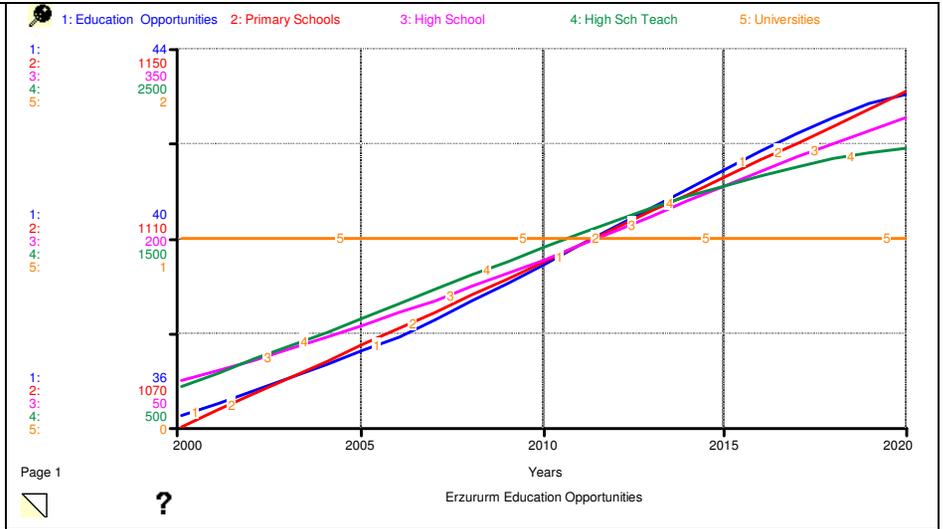
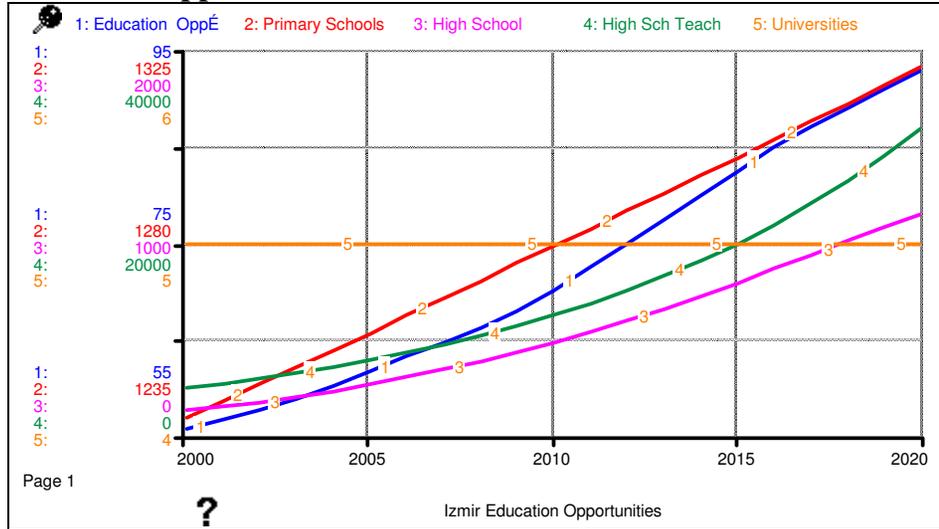
Health Care



Graph 5. Results of Health Care Indicators for Izmir

Graph 6. Results of Health Care Indicators for Erzurum

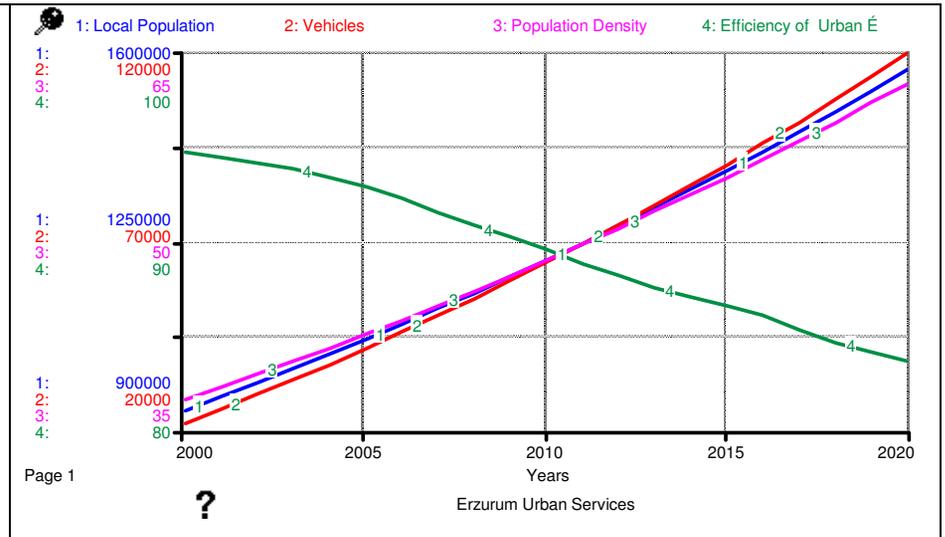
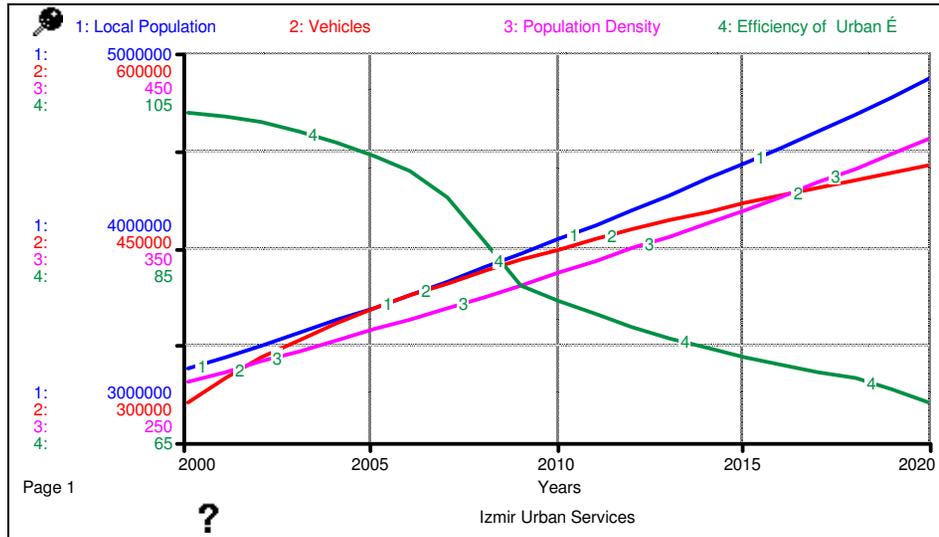
Education Opportunities



Graph 7. Results of Education Indicators for Izmir

Graph 8. Results of Education Indicators for Erzurum

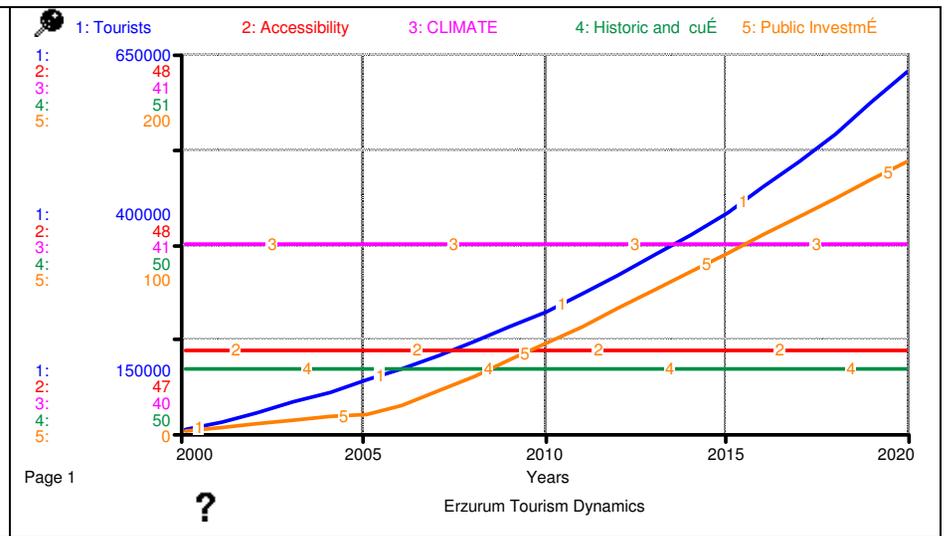
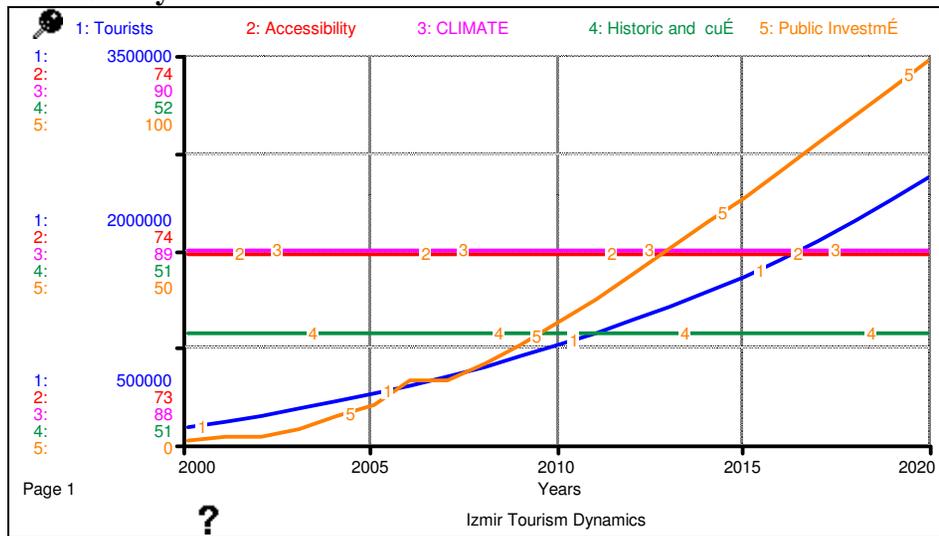
Urban Services



Graph 9. Results of Urban Service Indicators for Izmir

Graph 10. Results of Urban Service Indicators for Erzurum

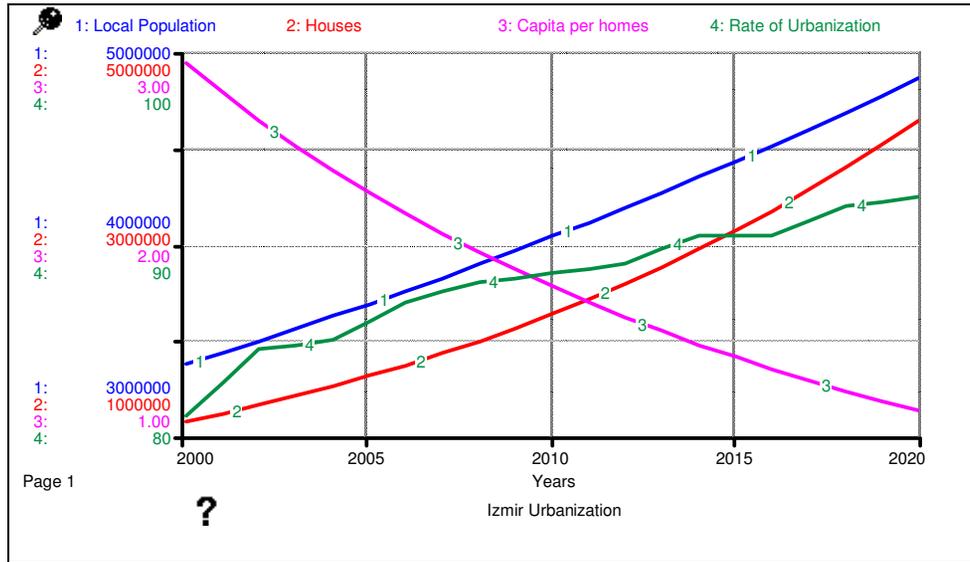
Tourism Dynamics



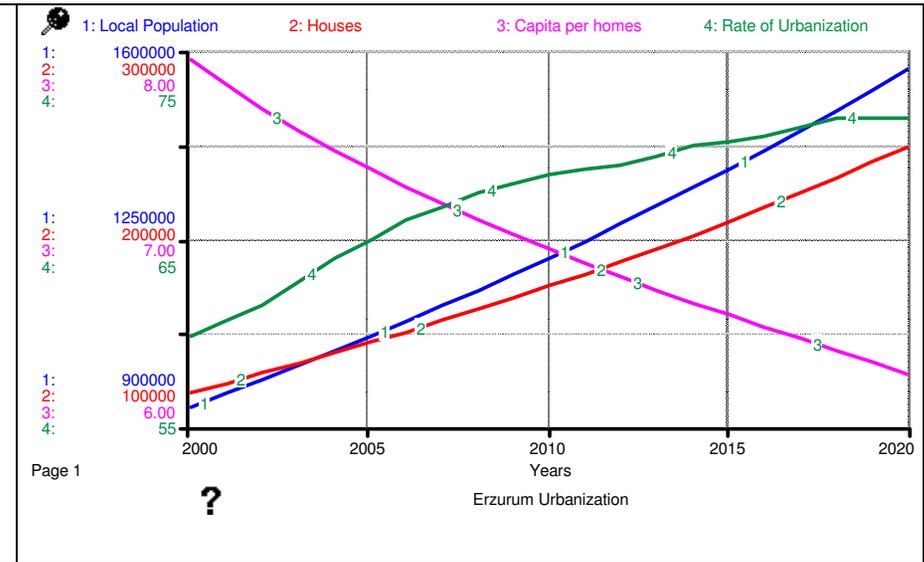
Graph 11. Results of Tourism Indicators for Izmir

Graph 12. Results of Tourism Indicators for Erzurum

Urbanization

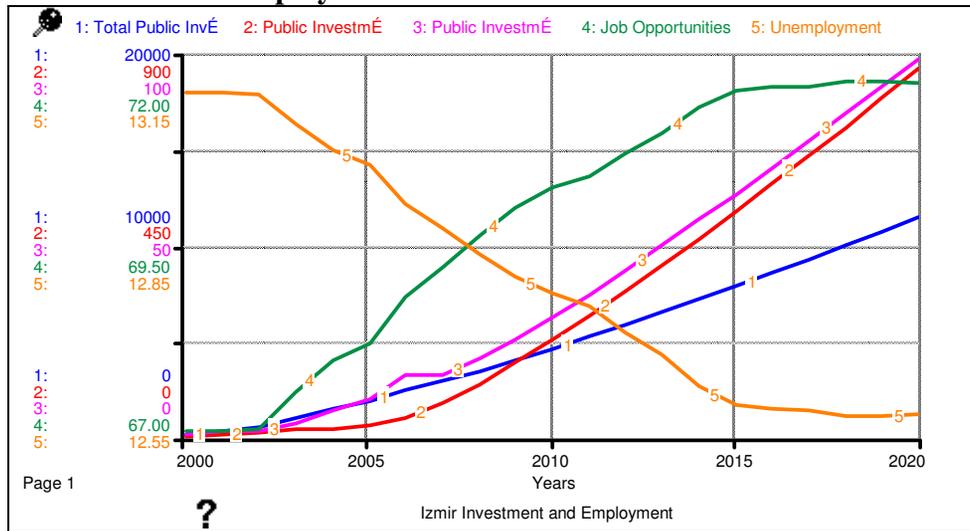


Graph 13. Results of Urbanization Indicators for Izmir

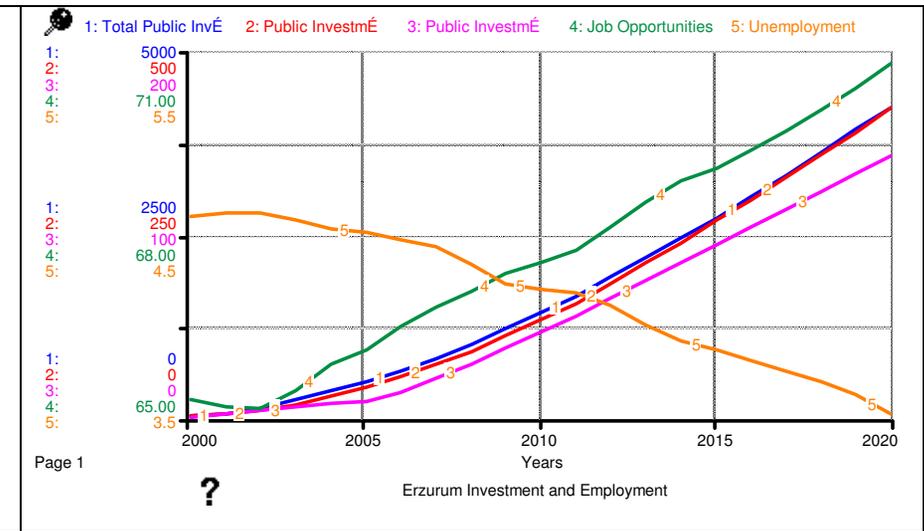


Graph 14. Results of Urbanization Indicators for Erzurum

Investment and Employment

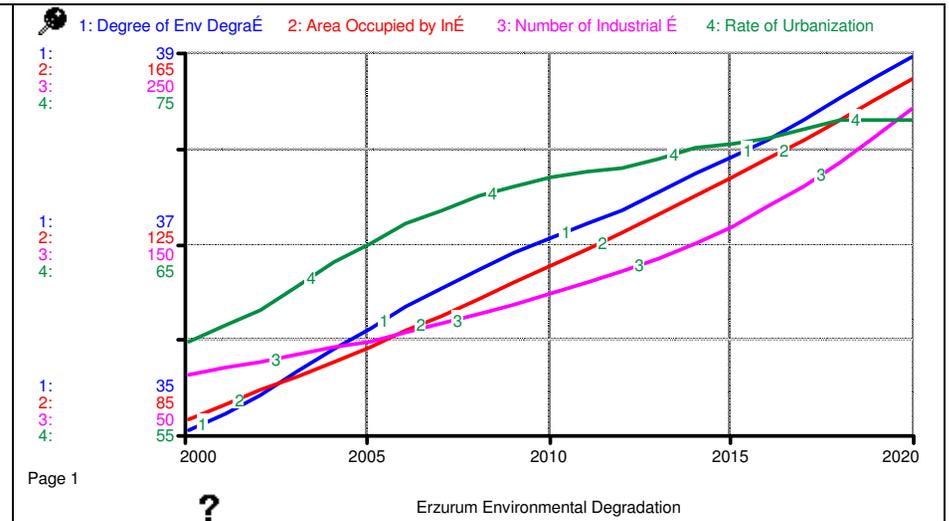
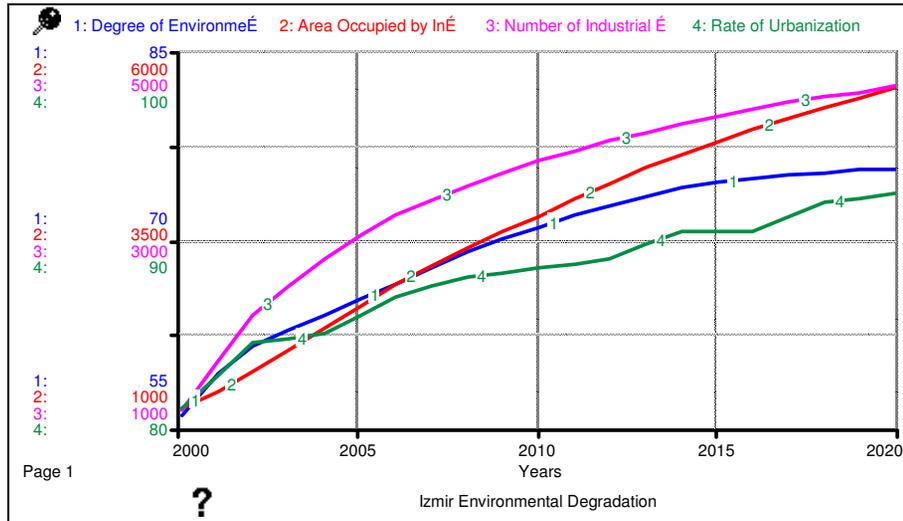


Graph 15. Results of Investment and Employment Indicators for Izmir



Graph 16. Results of Investment and Employment Indicators for Erzurum

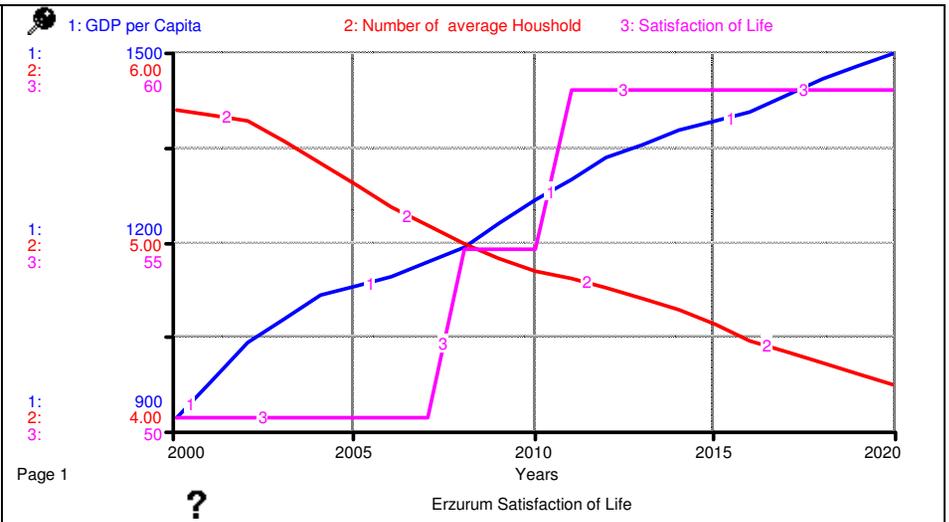
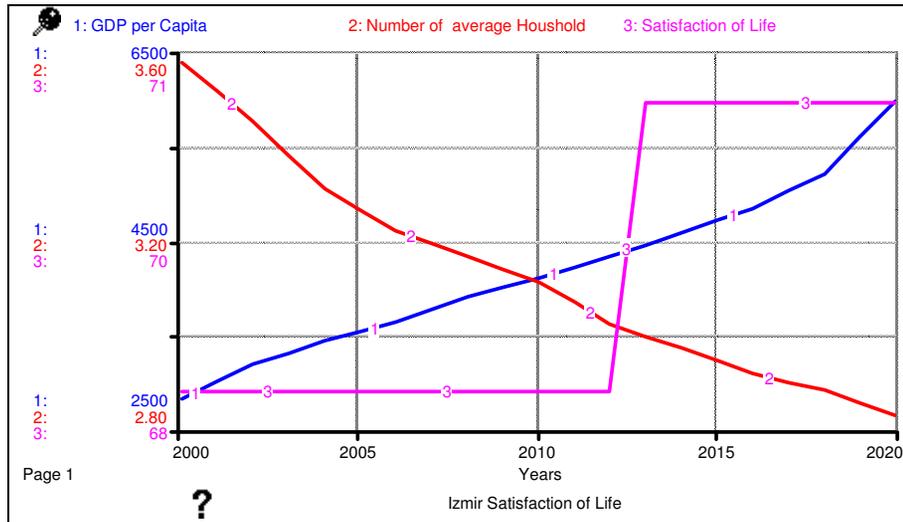
Environmental Conditions



Graph 17. Results of Environmental Indicators for Izmir

Graph 18. Results of Environmental Indicators for Erzurum

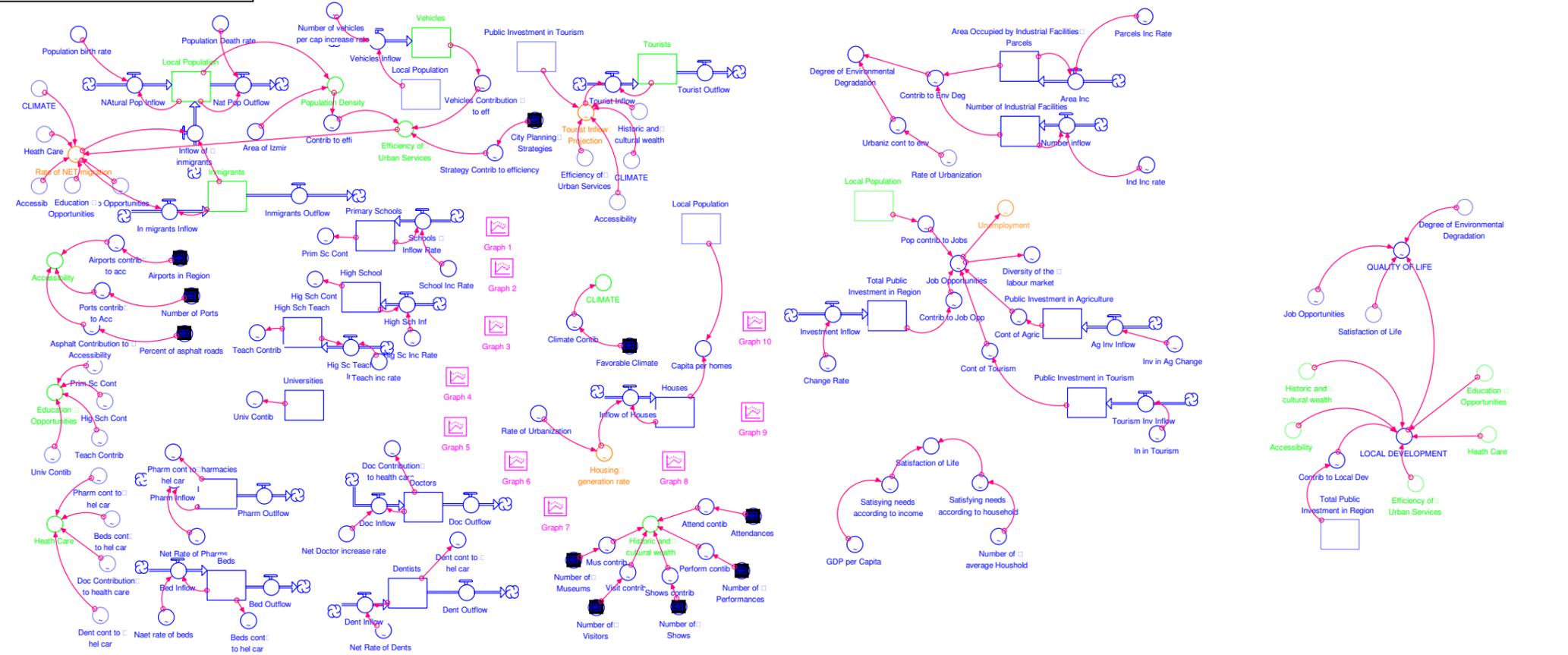
Satisfaction of Life



Graph 19. Results of Satisfaction of Life Indicators for Izmir

Graph 20. Results of Satisfaction of Life Indicators for Erzurum

Stella Model of Izmir



Stella Model of Erzurum

