جامعة عين شمس
كلية الهندسة

قسم التخطيط العمرانى

رسالة مقدمة للحصول على درجة الدكتوراه بعنوان

التخطيط لتنمية ريفية مستدامة فى مصر

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

(شَهِدَ ٱللَّهُ أَنَّهُ لَآ إِلَٰهَ إِلَّا هُوَ وَ ٱلْمَلَٰئِكَةُ وَ أُوْلُواْ ٱلْعِلْمِ قَآئِمَا بِٱلْقِسْطِ لَآ إِلَٰهَ إِلَّا هُوَ ٱلْعَزِيزُ ٱلْحَكِيمُ (18))

صدق الله العظيم

سورة آل عمران

اللهم اغفر لي التقصير أو الوهم أو السهو والنسيان في هذا العمل

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عنوان الرسالة   :التخطيط لتنمية ريفية مستدامة فى مصر
الدرجة العلمية   : دكتوراه

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إقرار

هذه الرسالة مقدمة إلي جامعة عين شمس للحصول علي درجة الدكتوراه في الهندسة المعمارية – قسم التخطيط العمراني.

إن العمل الذي تحتويه هذه الرسالة قد تم إجراؤه بمعرفة الباحثة في قسم التخطيط العمراني بكلية الهندسة جامعة عين شمس في الفترة الواقعة بين 2002 -2006م.

هذا ولم يقدم أي جزء من هذا البحث لنيل أي مؤهل أو درجة علمية لأي معهد علمي آخر

وهذا إقرار مني بذلك.................

التوقيع:

الاسم : **مروة أبو الفتوح السيد خليفة**

التاريخ : 2006/12/2

مستخلص الرسالة

اسم الباحثة : مروه أبو الفتوح السيد خليفة
بحث دكتوراه بعنوان : التخطيط لتنمية ريفية مستدامة فى مصر
جهة البحث : جامعة عين شمس ـ كلية الهندسة ـ قسم التخطيط العمراني

إن رصد التقدم نحو الاستدامة وتقييم أداء المجتمعات على مسار التنمية المستدامة يلقى حاليا اهتماما جادا. يعالج هذا البحث مشكله عدم وجود أداة تقييم شاملة لتقييم مدى تقدم أو تراجع المجتمعات الريفية في مصر علي مسار التنمية المستدامة. فبالبحث في النظم الحالية لتقييم منجزات التنمية للمجتمعات الريفية وجد إن دليل التنمية البشرية هو أداة التقييم الأوحد المستخدمة ، وباستعراض المنهجية المستخدمة في تكوين هذا الدليل وجد أن مؤشرات التنمية البشرية تعكس فقط البعدين الاجتماعي و الاقتصادي بينما يتم تجاهل الأبعاد الأخرى مثل الأبعاد البيئية و المؤسسية تماما. لذلك ، فان هذا البحث يهدف إلي تكوين مجموعه متكاملة من مؤشرات الاستدامة الملائمة لمحتوى و الظروف الخاصة بالقرية المصرية.

استنادا إلى مفهوم "نظم التفكير" أو "Systems Thinking" تم تطوير نموذج لتصور العمليات الحالية و العلاقات المتداخلة بين القضايا الرئيسية في القرية المصرية. يعتبر هذا النموذج الأساس الذي بني عليه تحديد المؤشرات الملائمة، و التي يمكن عن طريق قياسها تتبع العلاقات بين العوامل المختلفة و تقييم تأثير السياسات الخاصة بتنمية القرية المصرية. و قد تم تكوين ثلاث مجموعات مختلفة من المؤشرات في نطاق هذا البحث. هذه المجموعات هي المجموعة **الشاملة** و المجموعة **المركزية** و المجموعة **المؤقتة** ، و قد تم تطوير هذه المجموعات على التوالي، كل مجموعه تم تكوينها من أجل تحقيق هدف معين.

لاختبار قابلية المجموعة التي تم تطويرها من مؤشرات الاستدامة للتطبيق تم استخدام مدخلين مختلفين لتقييم أداء القرى اعتمادا على قيم مؤشرات الاستدامة الخاصة بهم. المدخل الأول يهدف إلى ترتيب القرى موضع التقييم بواسطة جمع قيم المؤشرات الفردية في قيمة مؤشر مركب واحد (دليل)، بينما يهدف المدخل الثاني إلى تقييم أداء القرى بناء على القيم الفردية لمؤشرات الاستدامة. بناء على نتائج التقييم بواسطة كلا من النظامين خلص البحث إلى تأكيد أن إدراج الأبعاد التي تم تجاهلها في دليل التنمية البشرية في المجموعة المتكاملة من مؤشرات الاستدامة نتج عنه اختلافات هامة في نتائج التقييم النهائية، علاوة على ذلك إن

التقييم بواسطة المجموعة المتكاملة من مؤشرات الاستدامة يمد صانعي القرار برؤية أكثر شمولية عن أداء القرى موضع التقييم مما يمكنهم من تتبع اتجاهات التنمية و وضع السياسات على أساس سليم.

الكلمات المفتاحية:
التقييم نحو الاستدامة ــ التنمية الريفية ــ مؤشرات الاستدامة ــ المشاركة الشعبية ــ نظم التفكير

ملخص الرسالة

اسم الباحثة : مروه أبو الفتوح السيد خليفة
بحث دكتوراه بعنوان : التخطيط لتنمية ريفية مستدامة فى مصر
جهة البحث : جامعة عين شمس ــ كلية الهندسة ــ قسم التخطيط العمراني

إن رصد التقدم نحو الاستدامة وتقييم أداء المجتمعات على مسار التنمية المستدامة من القضايا التى تلقى حاليا اهتماما جادا. يعالج هذا البحث مشكله عدم وجود أداة تقييم شاملة لتقييم مدى تقدم أو تراجع المجتمعات الريفية في مصر علي مسار التنمية المستدامة. فبالبحث في النظم الحالية لتقييم منجزات التنمية للمجتمعات الريفية وجد إن دليل التنمية البشرية هو أداة التقييم الأوحد المستخدمة، وباستعراض المنهجية المستخدمة في تكوين هذا الدليل وجد أن مؤشرات التنمية البشرية تعكس فقط البعدين الاجتماعي و الاقتصادي بينما يتم تجاهل الأبعاد الأخرى مثل الأبعاد البيئية و المؤسسية تماما. لذلك ، فان هذا البحث يهدف إلي تكوين مجموعه متكاملة من مؤشرات الاستدامة الملائمة لمحتوى و الظروف الخاصة بالقرية المصرية لكي تمد صانعي القرار برؤية أكثر شمولية عن أداء القرى موضع التقييم مما يمكنهم من تتبع اتجاهات التنمية و وضع السياسات على أساس متين.

لتحقيق تلك الأهداف ينقسم البحث إلي جزأين أساسيين يتقدمهم فصل المقدمة و الذي يشرح كيفية تأسيس القضية البحثية و المواضيع المختلفة التي تم دراستها لإعداد هذا البحث. حيث يوضح هذا الفصل المنطق وراء هذا البحث و كذلك الغرض و الأهداف الأساسية له و الأسئلة البحثية أيضا، كما يتضمن شرح لهيكل البحث و الأجزاء الرئيسية التي تشكله. ينقسم البحث إلى جزأين رئيسيين: "الدراسة النظرية" و "التطبيق". كل جزء يحتوى على عدد من الفصول كما يلي:-

الجزء الأول: "الدراسة النظرية"

ينقسم هذا الجزء إلى قسمين. يختص القسم الأول بدراسة "مؤشرات الاستدامة"، بينما يختص القسم الثاني بدراسة "الريف المصري". يتضمن القسم الأول الفصلين الثاني و الثالث حيث يتم بحث القضايا الرئيسية المتعلقة بتطوير و تطبيق

مؤشرات الاستدامة عمليا من خلالهما. يستعرض الفصل الثاني المنهجية المستخدمة فى تكوين دليل التنمية البشرية مع التركيز على أوجه القصور التى أدت إلى الاحتياج لمجموعة مؤشرات الاستدامة كأداة أكثر شمولا تتضمن الأبعاد التى تم تجاهلها فى دليل التنمية البشرية. يناقش هذا الفصل أيضا بعض القضايا المحيطة بتطوير و استخدام مؤشرات الاستدامة حيث يستكشف النماذج النظرية التي تشكل النقاش حول مؤشرات الاستدامة و هم: النموذج "الاختزالي" أو 'Reductionist' و النموذج "التشاركى" أو 'Participatory' و نموذج "العملية التعليمية المهيأة" أو'Adaptive learning process' ، مع التركيز على الأخير حيث أنه النموذج المستخدم في هذا البحث. أما الفصل الثالث فيتضمن دراسة تحليلية لعدد من المشاريع التي حاولت تطوير مجموعات من مؤشرات الاستدامة على المستويات المختلفة: العالمي، القومي، الإقليمي، المحلي لإعطاء أمثلة عملية للمذاهب و الأطر المختلفة المستخدمة في تكوين مجموعات مؤشرات الاستدامة.

يتضمن القسم الثاني الفصلين الرابع و الخامس، يشرح الفصل الرابع الأحوال و المعوقات الحالية في المناطق الريفية و التي تستلزم آليات حديثة للإصلاح، بينما يعطى الفصل الخامس شرح ملخص عن مفهوم المشاركة الشعبية و التطبيق العملي لها في مصر، و كذلك مفهوم اللامركزية كآليات حديثة للإصلاح و وسائل للتحفيز و التقدم نحو التنمية المستدامة. كما يستعرض مبادرات التنمية المختلفة التي اختصت بالمناطق الريفية مع التركيز على المدخل التخطيطي الحالي و كيف تلعب المشاركة الشعبية دورا جوهريا في المنهجية الحديثة المتبناة لإعداد المخططات الإستراتيجية للقرى المصرية.

الجزء الثانى: "التطبيق"
يشمل هذا الجزء ثلاثة فصول من الفصل السادس إلى الفصل الثامن، يصف الفصل السادس المنهجية المستخدمة في البحث لتطوير و اختبار المجموعة المتكاملة لمؤشرات الاستدامة، حيث يتضمن شرح تفصيلي للأسباب المنطقية لاختيار المدخل النظري المتبنى في البحث، و العملية التطبيقية المستخدمة. كذلك يتضمن شرح للطرق و الأدوات البحثية المستخدمة، مع توضيح كيف و لماذا تم الاستعانة بأدوات بحث كمية و كيفية معا لتنفيذ الجانب التطبيقي في البحث. أما الفصل السابع فيشرح العملية التطبيقية لتكوين النموذج الذي يصور العمليات الحالية و العلاقات المتداخلة بين المكونات التي تمثل النظام الحالي للقرية

المصرية. يعتبر هذا النموذج حجر الأساس لتكوين الثلاث مجموعات المختلفة لمؤشرات الاستدامة التي تم تطويرها خلال هذا البحث. هذه المجموعات هي المجموعة **الشاملة** و المجموعة **المركزية** و المجموعة **المؤقتة**. من خلال الفصل الثامن يتم اختبار مدى فعالية و قابلية العملية المستخدمة في تطوير المجموعة المتكاملة لمؤشرات الاستدامة (المجموعة المؤقتة في نطاق هذا البحث) للتطبيق، حيث يهدف إلى تحرى أثر استخدام المجموعة المتكاملة لمؤشرات الاستدامة في الإمداد بصورة أكثر شمولية عن اتجاهات التنمية في قرية معينة بديلا عن استخدام المؤشرات الاجتماعية و الاقتصادية فقط المكونين لدليل التنمية البشرية. و قد تم استخدام أسلوبين مختلفين لتقييم أداء بعض القرى المختارة كعينة اختبار بناء على القيم الحالية لمؤشرات الاستدامة الخاصة بهم. و قد أوضح تحليل مخرجات التقييم اختلافات جوهرية في ترتيب القرى وفقا لكل من استخدام دليل التنمية البشرية و المجموعة المتكاملة لمؤشرات الاستدامة مما يؤكد الفروض الأساسية لهذا البحث.

ينتهي البحث بالفصل التاسع و الذي يلخص مخرجات البحث و يوضح إلى أي مدى استطاعت هذه المخرجات استيفاء الغرض من البحث و الأهداف الأساسية له و كذلك إجابة الأسئلة البحثية الخاصة به، علاوة على ذلك يعكس هذا الفصل مدى فعالية المنهجية المستخدمة لتطوير المجموعة المتكاملة لمؤشرات الاستدامة الخاصة بالقرية المصرية. يخلص هذا الفصل إلى اقتراح المجالات الممكنة للبحث المستقبلي و التي لم يتم تناولها خلال هذا البحث.

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Planning for Sustainable Rural Development in Egypt

Thesis submitted for the degree of PhD

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Chapter (1): Introduction

Introduction

The idea of sustainable development has attracted groups with very different interests. Sustainable development as a concept aims to resolve the environment- economic- social conflicts by portraying itself as a multi-dimensional concept, which perceives environment, social and economic objectives in an integrated way. A key to sustainability is to conserve and use available resources wisely. Current literature concerning sustainable development challenges how it can be translated into principles on which practicable and effective policies can be based and which will reverse current unsustainable trends, principally of environmental degradation and social injustice. It focuses on gaps in implementing the concept successfully in the real world and the uncertainty on to what extent the concept has successfully embedded itself to guide the direction of planning and development routes (Elliott 1999; Owens and Cowell 2002). Within the context of this research sustainable development is addressed as a guiding concept and an integrative process to guide development on the right path.

Sustainability indicators are widely considered the way forward to operationalize sustainability. They can be a useful and possibly vital element in furthering the concept of sustainable development (Rennings and Wiggering 1997; Backhaus, Bock et al. 2002).

Therefore, this research aims to investigate in depth the process of developing and applying SIs and the powerful role they can play in assessing either the progress or the decline of rural communities on the path of sustainable development in Egypt.

The following sections describe how the research argument is established. They explain the different studied discourses required to setting up this research and how their integration is considered the underpinning of this research.

1

1.1 Sustainability Indicators

Indicators are considered a crucial guidance tool for decision-making in a variety of ways. Their main purposes are to simplify complex systems, translate physical and social science knowledge into manageable units of information and to reduce the volume of information to a workable level for decision-makers. They can highlight problems, which need urgent policy actions and help to measure and calibrate progress towards sustainable development goals and objectives. Moreover, they can provide an early warning, sounding the alarm in time to prevent economic, social and environmental damage (Hardi and Zdan 1997; Percival 1997; UNCSD 2001). They are also important tools to communicate ideas, thoughts and values because as one authority said:
"We measure what we value, and value what we measure."

(UNCSD 2001, p1)

Maclaren distinguished SIs from traditional indicators of economic, social, and environmental progress in her definition as follows:

"Sustainability indicators can be distinguished from simple environmental, economic, and social indicators by the fact they are: integrating, forward looking, distributional, and developed with input from multiple stakeholders in the community"

(Maclaren 1996)

However, although there is much agreement that SIs are the way forward, there is disagreement over which SIs to use, the appropriate framework for organizing indicators and even about the broad nature and characteristics of the SIs.

Much work has been carried out by various organizations and institutions to develop sets of indicators to measure progress towards sustainability on different scales; global, national, regional and local. Investigating a number of these projects indicates that there are certain phases included in such kinds of projects. A common gap amongst all of them is their neglecting the linkages between the various factors of influence, although much evidence assumed that, for the kind of sustainability issues relevant to urban development, environmental problems are typically caused by economic activity and economic activity is typically caused by social needs and demands (Ravetz 2000).

2

Therefore, this research aims at filling this gap by integrating a kind of systems mapping to depict the complex interrelationships between the various system components; social, economic, environmental and institutional ones. 'Systems Thinking' approach and its tools, as will be explained in chapter 3, proved to be valid to fill this gap.

1.2 Research Rationale

Exploring current attempts for assessing development achievements or current performances of rural communities in Egypt indicates that the Human Development Index (HDI) is the only well known tool for assessing development achievements at the national level, as well as at the local level since 2003. From this point an exploratory question is raised, which is:

Is the HDI, as a tool of measurement, satisfactory to provide policy makers with a comprehensive vision about the development needs and achievements in rural communities?

Investigating the nature of the HDI and the methodology behind elaborating the index indicates that the HDI along with its supplementary indicators reveals only the social and economic dimensions, while other dimensions such as the environmental and institutional dimensions are entirely neglected.

Moreover, the HDI is developed with a standard format to adapt all the regions and countries of the world. However, within the context of rural Egypt, there are certain issues of a particular importance to the villages' nature that need to be tackled and monitored over time to reflect whether they are moving towards the right direction or vice versa. These issues principally fall in the environmental dimension in terms of the continuous loss of agricultural land and the institutional dimension in terms of the substantial inflexibility in reallocation of resources and bureaucracy. Neglecting these issues in carrying out any assessment exercise concerning rural areas would definitely mask reality and lead to misleading results.

Therefore, developing an integrative set of SIs particularly for the Egyptian village that rigorously encompasses all the rural system components; (social, economic, environmental and institutional) and addresses its unique characteristics is perceived an appropriate assessment tool to alleviate the drawbacks of the HDI.

1.3 Research Aim, Objectives and Questions

The main aim of this research is to develop a set of SIs appropriate to the context of Egyptian villages. Therefore, it can be a guiding policy instrument for decision and policy makers, donors and concerned authorities in drawing policies, monitoring development and allocating resources on a solid basis.

To realize this aim, as well as to alleviate the drawbacks and gaps in current attempts of sustainability assessment, which will be explained in detail in the literature review, there are four *main objectives* the research attempts to realize, as follows:

1. Defining the meaning of sustainable rural development in Egypt in terms of identifying sustainability goals and objectives within the Egyptian village context.
2. Establishing a model, which envisages the current processes for a typical rural Egyptian village and addresses the interrelationships between the various system components in terms of environmental, economic, social and institutional components. This model should provide insight into the gaps, constraints and challenges currently threatens the sustainability of Egyptian villages.
3. Developing a set of SIs which allow the interactions between factors in such villages to be tracked and the impact of policy interventions to be assessed in order to monitor and evaluate the progress of these villages on the path of sustainable development.
4. Examining the impact of integrating the environmental and institutional components, which are neglected in the HDI on the assessment findings of the newly developed integrated set of SIs. This impact will be examined through applying both tools of assessment on a particular village.

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Research questions are then set out. They seek practical answers in order to realize the above research aim and objectives, as follows:

1. What are the key issues that compose the system components and envisage the current processes for the Egyptian village?
2. How to address the complex interrelationships between such system components?
3. What are the appropriate sustainability indicators that represent these issues?
4. Are these SIs valuable enough to replace the HDIs i.e. Does assessing progress using SIs lead to different results than using HDIs?

With respect to the fourth research question, it is borne in mind that it is possible that the HDI is in fact an adequate tool of measuring development achievement. This will be examined further in the final chapter, where the integrative SIs set is applied and assessment findings by both the HDI and the new SIs set are compared.

If the results indicate identical or very close ranking using the HDI and the integrative SIs set, in this case, this will mean that the relations between the environmental and institutional factors and the social and economic factors are highly connected and the HDI can be considered a satisfactory tool of assessment. If not, this will mean that integrating the environmental and institutional factors are of significant importance and ignoring these factors would lead to misleading results.

1.4 Research Structure

This thesis is divided into two parts; 'Literature Review' and 'Application'. Each part includes a number of chapters as shown in Figure (1-1).

Part (1): Literature Review

This part reviews literature about two main issues; 'Sustainability Indicators' and 'Rural Egypt'. It is divided into two sections. Section one includes chapters 2 and 3. It investigates the key issues related to developing and applying SIs in practice, while section two includes
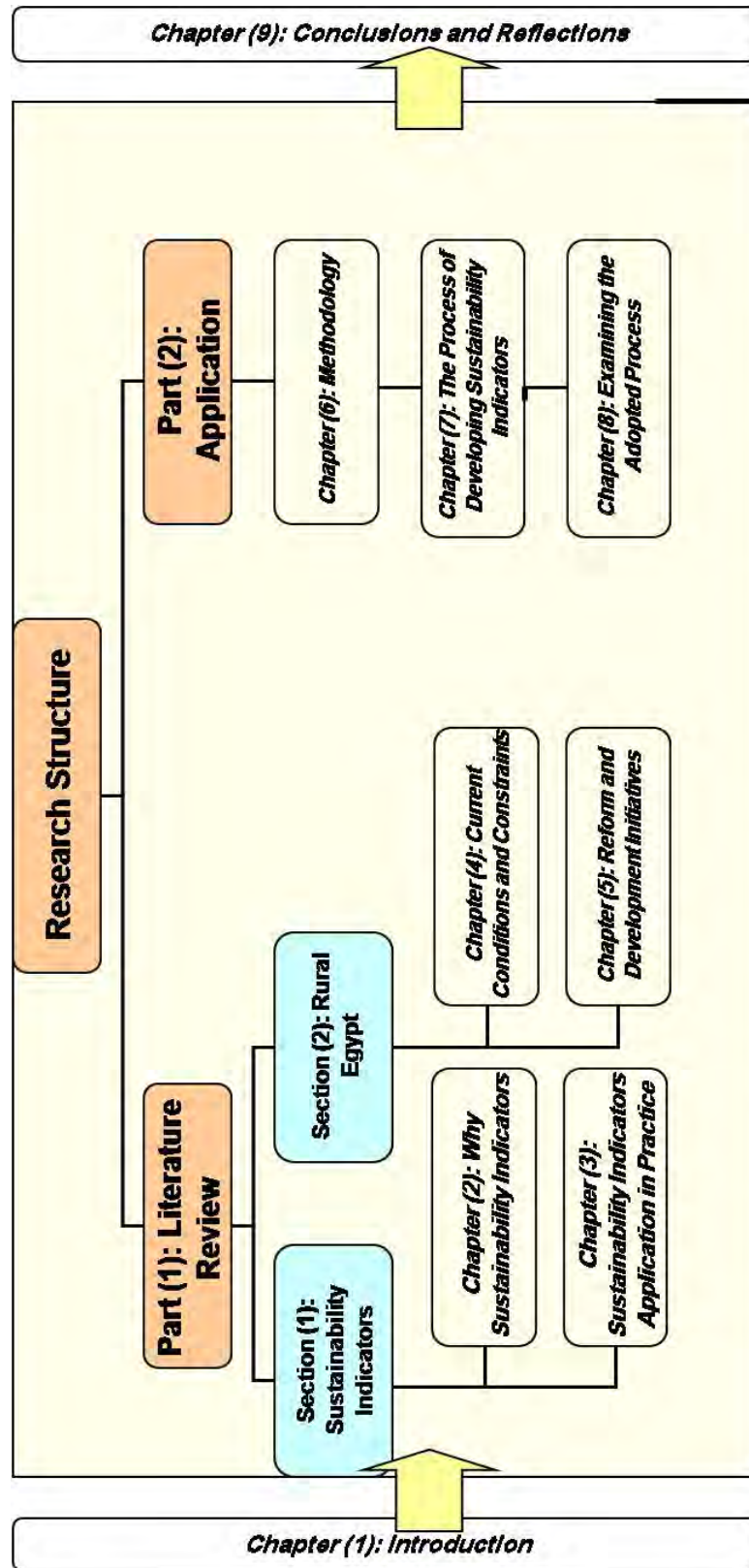
Figure (1-1): Diagram showing different parts of the research and the chapters they contain

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chapters 4 and 5. It provides an overview about issues related to rural Egypt.

Section one: Sustainability Indicators
Chapter (2): Why Sustainability Indicators

This chapter provides a brief explanation of the concept of sustainable development and the challenge it faces. The HDI is then explored with focus on its limitations, which lead to the need of the SIs as a more integrative tool to encompass the aspects neglected in the HDI. Key issues related to developing SIs are investigated, with focus on the powerful role they can play in operationalizing sustainability. It sets out some of the background issues surrounding the development and use of SIs and explores the different theoretical paradigms that formulate the literature on SIs.

Chapter (3): Sustainability Indicators Application in Practice

This chapter explores the application of SIs in practice. It examines a number of projects which attempted to develop sets of SIs on various scales; global, national, regional and local, to provide practical examples of the different approaches and frameworks used for formulating the indicator sets. The examination reveals gaps in modelling the issues and addressing the linkages between the system components in the majority of projects. Therefore, the research explores the 'Systems Thinking' approach and its tools, as it proved to be a valid tool to fill this gap and improve our understanding of the system structure.

Section two: Rural Egypt
Chapter (4): Current Conditions and Constraints

This chapter addresses the rural-urban gap and disparity as an initial entrée to explore the current condition and constraints in rural Egypt. It provides an overview of the distinguishing characteristics of Egyptian villages and their main problems, which necessitate new mechanisms for reform.

Chapter (5): Reform and Development Initiatives

This chapter provides a brief explanation of the concepts and practice of participation and decentralization in Egypt as mechanisms for reform and as a means towards promoting sustainable development. Moreover,

it explores the various development initiatives concerning rural areas, with focus on the current planning approach and how public participation plays an essential role in the new adopted methodology for preparing the strategic plans for Egyptian villages.

Part (2): Application

The application part encompasses three chapters from six to eight. Chapter six sets out the development of the adopted methodology, while chapter seven explains the procedure for developing a set of SIs appropriates to the Egyptian village context, and then chapter eight examines the applicability of the developed set of SIs.

Chapter (6): Methodology

This chapter provides a justification of the adopted theoretical approach as well as a reasoning of the adopted application process to develop a set of SIs appropriate to the Egyptian village context. Research methods are then explained, with clarification of how and why incorporation between quantitative and qualitative methods took place to carry out the adopted process.

Chapter (7): The Process of Developing Sustainability Indicators

This chapter explains the adopted process to establish a model, which envisages the current processes for a typical rural Egyptian village and addresses the interrelationships between the various system components in terms of environmental, economic, social and institutional components. This model is the bedrock for developing a **comprehensive** set of SIs, which in turn considers the basis for selecting a **core** set of SIs. Due to unavailability of data for some of the core set indicators, substitute indicators with available data replace the lacking ones. This resulted in a new set of SIs, which called a **provisional** set of SIs.

Chapter (8): Examining the Adopted Process

This chapter examines the credibility and applicability of the adopted process for developing an integrative set of SIs (i.e. the provisional set within this research context). It aims at investigating the impact of using the integrative set of SIs in providing a holistic vision about development trends in a particular village instead of using only social

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and economic indicators, which are composing the HDI. Two different approaches are employed to assess the performance of the test sample villages based on their indicator states. The analysis of findings indicates extreme differences in villages' ranks due to using the HDI and the developed SIs, which confirms the basic assumptions of this research.

Chapter (9): Conclusions and Reflections

This chapter draws together the conclusions from the research and explores to what extent the research findings fulfilled its own aim and objectives as well as answered the research questions. Then, it reflects on the effectiveness of the adopted approach and the used methodology to develop an integrated set of SIs appropriate to the Egyptian village context. It ends with suggesting potential areas for further research, which could not be tackled within the context of this research.

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Part one: Literature Review

Section (1): Sustainability Indicators

Chapter (2): Why Sustainability Indicators

Introduction

Indicators have been seen by many as the core element in operationalizing sustainability (Rennings and Wiggering 1997; Backhaus, Bock et al. 2002). Nevertheless, although there is much agreement that sustainability indicators (SIs) are the way forward, there is disagreement over what SIs to use, the appropriate framework for organizing indicators and even about the broad nature and characteristics of the SIs.

This chapter aims at investigating the key issues related to developing and applying SIs and the essential role that SIs can play as a tool for assessing progress towards sustainable development. It starts with providing a brief explanation of the concept of sustainable development and the challenge it faces. Then, it explores the concept of the HDI and the methodology behind its elaboration with focus on its limitations, which lead to the need of the SIs as a more integrative tool to encompass the aspects neglected in the HDI. Key issues related to developing SIs are then investigated, with focus on the powerful role they can play in operationalizing sustainability. It sets out some of the background issues surrounding the development and use of SIs. It explores the different theoretical paradigms that formulate the literature on SIs; 'Reductionist', 'Participatory' and 'Adaptive learning process', with focus on the latter as it is the adopted paradigm for this research.

2.1 The Concept of Sustainable Development

The origins of the concept of sustainable development have been seen to lie in two bodies of literature. These are 'development thinking' and 'environmentalism' which were quite separate previously. Within the

notion of sustainable development, the vision of the two areas of study came closer together with the realization that environment and development were interdependent and mutually reinforcing issues. Development is no longer seen in exclusively economic terms.

The view now taken is that we need to conserve in order to develop, rather than the reverse (Redclift 1992, p 398). Sustainable development as a concept aims to resolve the environment- economic- social conflicts by portraying itself as a multi-dimensional concept, which perceives environmental, social and economic objectives in an integrated way. This is what was missing in previous strategies, which seemed to overemphasize on the economic dimension of development and gave no attention to addressing the cost of the environmental dimensions.

2.1.1 History of the Concept

The term "sustainable development" first came to prominence in the World Conservation Strategy (WCS) published by the World Conservation Union in 1980, which had argued from a dominantly conservationist environmentalist standpoint (John Kirkby, Phil O'Keefe et al. 1995 ,p 1) .In 1987, it achieved a new status with the publication of *Our Common Future* report, when the World Commission on Environment and Development (WCED), also known as the Brundtland Commission called for a 'common endeavour and for new norms of behaviour at all levels and in the interests of all' (WCED 1987). The Brundtland report has gained even greater attention since the United Nations Conference on Environment and Development (UNCED) "Earth Summit" held in Rio de Janeiro, Brazil in June 1992 where the international community adopted Agenda 21, an unprecedented global plan of action for sustainable development. Agenda 21 was a landmark achievement in integrating environmental, economic and social concerns into a single policy framework. By the late 1990s, the term sustainable development had gained a currency well beyond the confines of global environmental organizations and is widely used in many political arenas and academic fields. By the beginning of the new millennium, tens of thousands of participants from all over the world gathered in Johannesburg, South Africa to adopt concrete steps and identify quantifiable targets for better implementing Agenda 21. At the Johannesburg Summit in 2002 "the World Summit on Sustainable

Development" the focus was on turning plans into actions. The summit aimed to evaluate the obstacles to progress on the path of sustainable development and the results achieved since the 1992 Earth Summit (United Nations 2002).

2.1.2 Definition and meaning

Literally, sustainable development refers to maintaining development over time. However it has been suggested that there are over 100 definitions of sustainability and sustainable development currently in circulation (Srinivas 2005). The most widely quoted definition is that of Brundtland, which defines sustainable development as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"
(WCED 1987, p8)

The Brundtland definition is seen to encompass some very challenging notions, such as those of *equity, needs* and *limits*.

- *Equity* encompasses two main dimensions; *Inter-generational and Intra-generational equity*. Inter-generational equity is about how resources should be shared between current and future generations. What should current generations hand down to future generations is not only "man-made capital" such as roads, schools and historic buildings and "human capital" such as knowledge and skills, but also "natural / environmental capital" such as clean air, fresh water, rain forests, the ozone layer and biological diversity (Blowers 1993; Bowers 1997). Every human society exhibits a tension between a desire to exploit and an obligation to protect. However, Intergenerational trade-offs have to be made; society has to choose implicitly or explicitly between the use of natural resources for economic development by the present generation and their conservation for later use by future generation (P. Nijkamp and Soeteman, 1992) cited in (Elrefaie 2003,p34). Intra-generational equity therefore needs to be addressed. It has two dimensions: between countries and particularly between developed and developing countries and within a country, between its citizens. The latter is in the focus of this research. Equity between urban and rural citizens within the nation and between male and female in rural areas is one of the essential principles to promote progress on the path of sustainable development.

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'Needs' mean different things to different people. Kirkby noted that Brundtland definition has a strong people-centered stance concentrating on the satisfaction of human needs and the role of the environment in meeting them rather than for example on protection of the environment in general as WCD did (John Kirkby, Phil O'Keefe et al. 1995, p2). However, what exactly is meant by needs was not clear in the definition. Basic needs to ensure survival such as food and shelter are obviously included, but it is not clear how much more than survival is involved in 'needs'. Elliot advocated the important role of involving the public in addressing their needs (Elliott 1999, p 184). She argued that successful sustainable development projects are those which prioritize local knowledge and needs in programs, which enable communities to improve their own welfare and that of the environment. Owens added that more inclusive public involvement is essential for a truly sustainable community (Owens and Cowell 2002, p58). Chambers stresses that 'People should be put first and poor people and their priorities first of all'. Satisfaction of people's needs is crucial and decision-makers should allow them the chance to express their needs and get rid of the idea that they are in a better position than the poor to recognize what is good for them (Chambers 1986).

"The environment and development are means not ends in themselves. The environment and development are for people, not people for environment and development"
(Chambers 1986, p7)

The issue of *'Limits'* is well discussed in the 'Limits to Growth', which was published by Meadow's team in 1972 in the form of a report to the Club of Rome (Donella Meadows 1972). In that time, the Limits to Growth attracted enormous attentions and provoked intense debate. By using system dynamic theory and a computer model called 'World3', the book analyzed 12 scenarios that showed different possible patterns and environmental outcomes of world development over two centuries from 1900 to 2100. The results of the study concluded that if the trends continued unchanged, the limits to growth on the planet will be reached sometime within the next one-hundred years (Donella Meadows 1972, p23).

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Though Limits to Growth faced significant criticism, see (Redclift 1987, pp52-55; Reid 1995, pp30-35), however, such critics couldn't overlook the basic assumption of the book that:

"Growth that depends on the consumption of more and more resources could not continue indefinitely in a finite world".

30 years later, an update to the original Limits is produced, in which the authors concluded that humanity is dangerously in a state of overshoot and the need to change and correct human current course is crucial to avoid the serious consequences of overshoot in the 21st century (Donella Meadows 2004). They suggested a few general guidelines for what sustainability would look like, and what steps should be taken to get there. Principally, they concern minimizing the use of non-renewable resources, preventing the erosion of renewable resources, using all resources with maximum efficiency and slowing the exponential growth of population and physical capital.

2.1.3 Challenge

The challenge of the idea of sustainable development lies in how it can be translated into principles on which practicable and effective policies can be based and which will reverse current unsustainable trends of environmental degradation and human oppression. It can be inferred even from the Brundtland definition that there is no hint of what sustainable development involves in practice, what commitments it requires and what the costs will be (Reid 1995; Owens and Cowell 2002).

Omar added that, there has been a gap in terms of implementing the concept successfully in the real world and there exists uncertainty as to what extent the concept has successfully penetrating itself to guide the direction of planning and development routes. Agenda 21 and many other documents identify the route to sustainable development as via the integration between economic, social and environmental components (Omar 2003, p 13). However, in reality, to what extent the integration of these three components has been achieved is still contested.

It is now widely recognized that development to date has too regularly led to the degradation of resources. However, the current dilemma facing

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the different interests in sustainable development concept such as planners, practitioners and policy making is: how to establish new patterns and processes of development which are more sustainable? However, there can be no single or neatly defined prescription for change. There are no 'blueprints' for sustainable development: sustainable development actions depend on embracing complexity itself. Flexible solutions are required as the nature of the problem evolves and as policies, programs and projects proceed (Elliott 1999, p 184).

2.2 The Notion of Sustainability Indicators

Indicators have been widely employed in a diverse range of circumstances for perhaps thousands of years. For example, farmers have long employed simple indicators of soil fertility such as soil color. Indicators tend to simplify complex phenomena into quantifiable measures that can be readily communicated. Abolina and Zilans define indicators as:

"Indicators are pieces of information that highlight what is happening in a large system. They are small windows that provide a glimpse of the 'big picture'".
 (Abolina and Zilans 2002, p 307)

However, there are also limits to how useful indicators may be. They can help measure change over time, but don't measure end objectives. For example, a speedometer can show that a car has accelerated from 35 mph to 55 mph, but cannot show the car's destination (Crossroads Resource Center 1999, p10).

The history of using indicators as a tool in assessing progress goes back to the late 1940s, when GDP/GNP is considered as an indicator of the overall wellbeing of a given nation. Over the past half-century, many have spoken out against this practice. In 1987, the WCED (the Brundtland Commission) added its voice to the appeal for new techniques of measuring progress that would go beyond economic signals and capture a fuller sense of human and ecological well being, which lay at the heart of the idea of sustainable development (Hardi and Zdan 1997). The 1992 Earth Summit recognized the important role that indicators can play in helping countries to make informed decisions

concerning sustainable development. This recognition is articulated in Chapter 40 of Agenda 21, which calls on countries at the national level, as well as international, governmental and NGOs to develop and identify indicators of sustainable development that can provide a solid basis for decision-making at all levels (UNCSD 2001). In response to this call, considerable efforts and initiatives to develop sets of SIs have been started at all levels; global, national, regional and local.

2.2.1 Human Development Index (HDI)

In 1990 the United Nations Development Programme (UNDP) introduced the HDI as a composite indicator, which would more fully reflect the main dimensions of development in society, as it became clear in the 1980s that measuring development solely on the basis of GDP was not sufficient in understanding the differences between countries' development or for explaining the obstacles to achieving human development. The HDI is composed of three sub indices. They are **health, knowledge,** and **income**. They represent achievements in three key human development areas: **longevity, educational attainment** and **standard of living** respectively. The measuring of the main components of the three sub-indices is as follows (UNDP, ORDEV et al. 2003):

1. Health: Health is measured by life expectancy at birth, as it reflects the general health condition of the population reflected in the average age of death.
2. Knowledge: Knowledge is measured as a weighted average of:
    • The rate of literacy among adults 15+ (two-thirds)
    • The rate of enrollment in elementary, preparatory, secondary and college education (one-third)
3. Income: Income is measured by the real GDP per capita (PPP[1]$)

The values of the indicators from which the indices are calculated give a certain insight into the achieved performance. From the UNDP point of view, the HDI represents a rich source of information for planning and assists in defining the priorities when launching policies. It aims at enabling decision-makers to reorient resources towards sectors and areas

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[1] PPP = Purchasing Power Parity

suffering from poverty, unemployment, illiteracy and the decline of social services (United Nations Development Programme and the Institute of National Planning 2003, p15).

2.2.1.1 Method of Calculation

Before the calculation of the HDI, an index for each key component is calculated separately. For that, maximum and minimum values (posted goals) of the four basic variables are determined as shown in Table (2-1). The index for any component of HDI can be computed as:

$$100 \left(\frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}} \right)$$

HDI is then calculated as the simple average of the three indices. For details of the method of calculation for each index, see UNDP (2006).

Indicator	Maximum Values	Minimum Values
life expectancy at birth	85	25
Literacy (%)	100	0
Combined enrollment ratio (%)	100	0
GDP per capita (PPP$)	40000	100

Table (2-1): Maximum and minimum values of variables for calculating the HDI. Source: (United Nations Development Programme and the Institute of National Planning 2003)

2.2.1.2 Limitations of the HDI

Investigating the nature of the HDI and the methodology behind elaborating the index indicates that the HDI along with its supplementary indicators reveals only the social and economic dimensions, while other dimensions such as the environmental and institutional dimensions are completely neglected. The latter dimensions are of almost equal importance to the former. Moreover, within the context of this research, the environmental and institutional dimensions, as will be broadly explained in chapter 4, are of crucial importance. Neglecting these dimensions whilst carrying out any assessment exercise would certainly lead to deceptive results. Therefore, the need to develop a more integrative assessment tool that encompasses all the dimensions comprehensively emerged. SIs are perceived an appropriate assessment tool that can capture all the dimensions thoroughly.

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2.2.2 Nature of sustainability indicators

Hart distinguished SIs from traditional indicators of the economy, society, and the environment for measuring progress.

Traditional indicators, such as stockholder profits, poverty rate, and water quality measure changes in one part of a community, as if they were entirely independent of the other parts, while SIs reflect the reality that all of the parts are very tightly interconnected (Hart 2000), as shown in Figure (2-1).
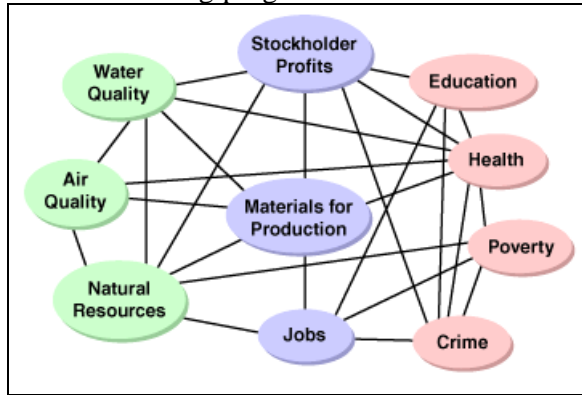

Figure (2-1): Defining communities as a web of interactions among the environment, the economy and society. Source: (Hart 2000)

As the figure illustrates, for example, the natural resource base provides the materials for production on which jobs and stockholder profits depend. Jobs affect the poverty rate and the poverty rate is related to crime. Air quality, water quality and materials used for production have an effect on health.

A more formal definition of SIs by Maclaren is as follows:

"Sustainability indicators can be distinguished from simple environmental, economic, and social indicators by the fact they are: integrating, forward looking, distributional, and developed with input from multiple stakeholders in the community"
(Maclaren 1996)

The author believes that assessing sustainability requires this type of integrated view of the measured system. It requires multidimensional indicators that show the links among the different dimensions of the system: economic, social, environmental and institutional and point to areas where these links are weak. This allows opportunity to perceive where the problem areas are and assists in clarifying the way to fix them.

2.2.3 Characteristics of effective sustainability indicators

There are certain characteristics that effective indicators have in common. To be effective, any indicator must do what the word implies: it must indicate (David J.Briggs and Connelly 2000, p8). To do so, an indicator should fulfill two main functions. Firstly, it should fulfill the criteria in Table (2-2) (Ravetz, McEvoy et al. 2001, p11), though these criteria taken all together are a huge challenge, and in fact rarely any initiative of developing SIs in practice would fulfill all of them.

- **Accessibility** - can it be understood by different users, from policy, technical or public spheres?
- **Availability** - is the data actually there?
- **Quality** – can the data be trusted and validated?
- **Durability** – can the data be maintained over a period of time without excessive cost?
- **Depth and breadth** – can the indicator help to monitor the differences in space or changes over time?
- **Disaggregation** - can the datasets behind the indicator represent peaks, troughs, averages, distributions etc?
- **Comparability** – can the indicator compare horizontally between different areas, or vertically between local, regional, national and international levels?
- **Participation** – are users of the indicator involved in its selection, collection and monitoring?
- **Linkages** – is the indicator linked to an objective or target by which it can be evaluated?
- **Relevance** - is there a direct link from reception of information by 'users' to taking action?
- **Resonance** – is the indicator based on a quality with meaning to different users?

Table (2-2) Characteristics of effective sustainability indicators

Secondly, it should be based on a known link or relationship to the issue it is intended to indicate which generally concern an 'issue of concern' or 'feature of interest'. In this context, four main types of linkage can usefully be recognized as follows (David J.Briggs and Connelly 2000, p9):

- *Causal*: the indicator and issue of concern are linked because one **causes** the other.

- *Contingent*: the indicator and target are linked because one is a necessary **precondition** for the other.
- *Statistical*: the indicator and target are linked by a **statistical association**. In this case, one does not cause or act as a precondition for the other, but both of them tend to vary in broad harmony, often because they are related to some other, common factor, or because they are part of a complex web of association
- *Component*: indicator and target are linked because one represents a **sub-component** of the other**.**

2.2.4 Types of sustainability indicators

Basically, indicators can be divided into two types; quantitative and qualitative. A good example that summarizes the distinction between the two types can be found in (Bell and Morse 2001, p 298), as shown in Table (2-3). The example indicates different methods using either quantitative or qualitative SIs to measure changes in cars using density over a period of 5 years.

Type of SIs	Example
1 Quantitative SIs based on counts, mass, lengths, volumes, densities, etc.	Density of cars recorded by counting presence on a sample stretch of road(s)/registration, etc. of vehicles over a period of time.
2 Quantitative SIs based on the scoring or ranking of essentially qualitative information	Asking people to score their perception as to the change in car density over a 5-year period. Simple example: (1) large decrease; (2) small decrease; (3) no change; (4) small increase; (5) large increase
3 Qualitative SIs based on color, shape, feel, smell, taste, impression, etc.	People asked for their views, using focus group interview techniques, as to the change in the density of cars over the last 5 years

Table (2-3): An example of quantitative and qualitative SIs. Source: (Bell and Morse 2001)

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2.2.5 Critique and Challenge

The notion of SIs similar to the notion of sustainability has its own proponents as well as its own opponents. There are a number of critics of SIs: one of the major criticisms regarding SIs is that they attempt to encapsulate complex and diverse processes in a few relatively simple measures. In fact this is not a new problem, Bell and Morse argued, the world is a complex place and people have had to make sense of it for a long time. The obvious approach is to deal with the world in manageable bits (Bell and Morse 1999, p30). Central to the sustainability debate, falls the question of:

Is it really reasonable to use simple SIs to gauge such a whole complex issue as sustainability?

Harrington responded to the above question, pointing out:

'It is never possible to deal with any problem (not just sustainability problems) in all its real-world complexity. Scientists "have to simplify to survive"'

(Harrington 1992)

He rejects the notion that quantifying sustainability is not possible precisely because it has been successfully achieved with complex biological systems.

Similarly, Ravetz emphasizes the need for SIs especially at the local level, which provides the necessary information to enable more informed decision-making, on the basis that:

"If you can't measure It, you can't manage it"

(Ravetz, McEvoy et al. 2001, p8)

The author believes that any attempt for simplifying reality is imperfect, but what is the alternative? The author agrees with both Harrington and Ravetz in their point of views regarding the necessity to 'simplify to survive' and 'measure to manage'. But, as to how far this simplification should take place, this is the ***challenge***.

Simplification that masks reality or misses crucial issues is completely rejected. The required simplification is the one that can capture the real key issues with their complex interrelationships, as well as remaining understandable and manageable by the intended users. Undoubtedly, there will be trade-offs, but the challenge is to keep this trade-off within

the acceptable limits of simplification, which do not result in misleading findings. Therefore, the process of developing and applying SIs should be very cautious with regard to the issue of simplification.

The next section explores the different theoretical paradigms that formulate the literature of SIs and where this research fits within these different paradigms.

2.3 Methodological Paradigms

The literature on SIs used to fall into two broad methodological paradigms; '*Reductionist'* and '*Participatory'* (Bell and Morse 2001). Moreover, in the last few years the third paradigm the 'Adaptive learning process' or the 'Integrated methodology' appeared, which calls for integrating approaches from different paradigms to offer a holistic approach for measuring progress towards sustainable development (Mark Reed, Evan D. G. Fraser et al. forthcoming).

2.3.1 'Reductionist' Paradigm

'*Reductionist'* is also referred to as 'expert-led', 'top–down' or 'external' paradigm; finds its epistemological roots in scientific reductionism. Adherents of this paradigm are typically scientists and economists (eg. Atkinson and D Pearce 1996; Rennings and Wiggering 1997) and some planners (eg. Huang, Wong et al. 1998). Scientists deal with a complex system by breaking it down into components and studying how these work in isolation and then together.

This reductionist approach is common in many fields, such as landscape ecology, conservation biology, as well as economics. It acknowledges the need for indicators to quantify the complexities of dynamic systems, but does not necessarily emphasize the complex variety of resource user perspectives. Proponents of this approach have been thoroughly critiqued for ignoring local contextual issues (Mark Reed, Evan D. G. Fraser et al. 2005), which is contrary to the spirit of Agenda 21 that puts public involvement at the front of any planning process and challenges policy-makers to allow people to define sustainability for themselves.

2.3.2 'Participatory' Paradigm

'*Participatory*' also referred to as 'community-based', 'bottom–up' or 'conversational' paradigm (Bell and Morse 2001); draws more on the social sciences. Proponents of this paradigm emphasize the importance of understanding local context to set goals and establish priorities and that sustainability monitoring should be an on-going learning process for both communities and researchers (Chambers 1993; Chambers 1997). They argue that to gain relevant and meaningful perspectives on local problems, it is necessary to actively involve social actors in the research process to stimulate social action or change (Pretty 1995). Notwithstanding, the popularity of the participatory approach, it has been criticized by some practitioners and academics (Connelly and T. Richardson 2005). Their main concern is, if community controls everything and if local people fall prey to the same beliefs and values that have led to current unsustainable positions, then, the findings may not serve the needs of sustainable development. A summary of SIs literature and how proposed paradigms can be divided into top–down and bottom–up is shown in Table (2-4).

The strengths and weaknesses of both approaches are summarized in Reed, Fraser et al (forthcoming). Indicators that emerge from top–down approaches are generally collected rigorously, scrutinized by experts, and assessed for relevance using statistical tools. However, this sort of approach often fails to engage local communities. Indicators from bottom–up methods tend to be rooted in an understanding of local context and are derived by systematically understanding local perceptions of the environment and society. This not only provides a good source of indicators, but also offers the opportunity to enhance community capacity for learning and understanding. However, there is a danger that indicators developed through participatory techniques only may not have the capacity to accurately or reliably monitor sustainability. Whilst it is simple to view these two approaches as fundamentally different, there is increasing awareness and academic debate on the need to develop innovative hybrid methodologies to capture both knowledge repertoires (Batterbury, Forsyth et al. 1997; Nygren 1999).

Methodological Paradigm / Basic Steps	Reductonist (Top – down)	Participatory (Bottom – up)
(1) Establish context	Typically land use or environmental system boundaries define the context in which indicators are developed, such as agricultural system	Context is established through local community consultation that identifies strengths, weaknesses, opportunities and threats for specific systems
(2) Establish sustainability goals and strategies	Natural scientists identify key ecological conditions that they feel must be maintained to ensure system integrity	Multi-stakeholder processes identify sometimes competing visions, end-state goals and scenarios for sustainability
(3) Identify, evaluate and select indicators	Based on experts' knowledge, researchers identify indicators that are widely accepted in the scientific community & select the most appropriate ones.	Communities identify potential indicators, evaluate them against their own (potentially weighted) criteria and select indicators they can use
(4) Collect data to monitor progress	Indicators are used by experts to collect quantitative data which they analyze to monitor environmental change	Indicators are used by communities to collect quantitative or qualitative data that they can analyze to monitor progress towards their sustainability goals

Table (2-4): The basic steps of the '*Reductionist'* and the '*Participatory'* methodological paradigms. Source: (Mark Reed, Evan D. G. Fraser et al. forthcoming)

2.3.3 'Adaptive learning process' Paradigm

'*Adaptive learning process'* appeared as a response to the above debate, also referred to as 'integrated methodology' (Mark Reed, Evan D. G. Fraser et al. 2005; Mark Reed, Evan D. G. Fraser et al. forthcoming). It emphasizes the importance of participatory approaches setting the context for sustainability assessment at local scales, as well as stressing

the role of expert-led methods in indicator evaluation and dissemination. Proponents of this paradigm advocate developing quantitative and qualitative indicators, which are both scientifically rigorous and objective, while remaining easy to collect and interpret for communities. Figure (2-2) indicates the main stages of the 'Adaptive learning process' (Mark Reed, Evan D. G. Fraser et al. forthcoming, p9).
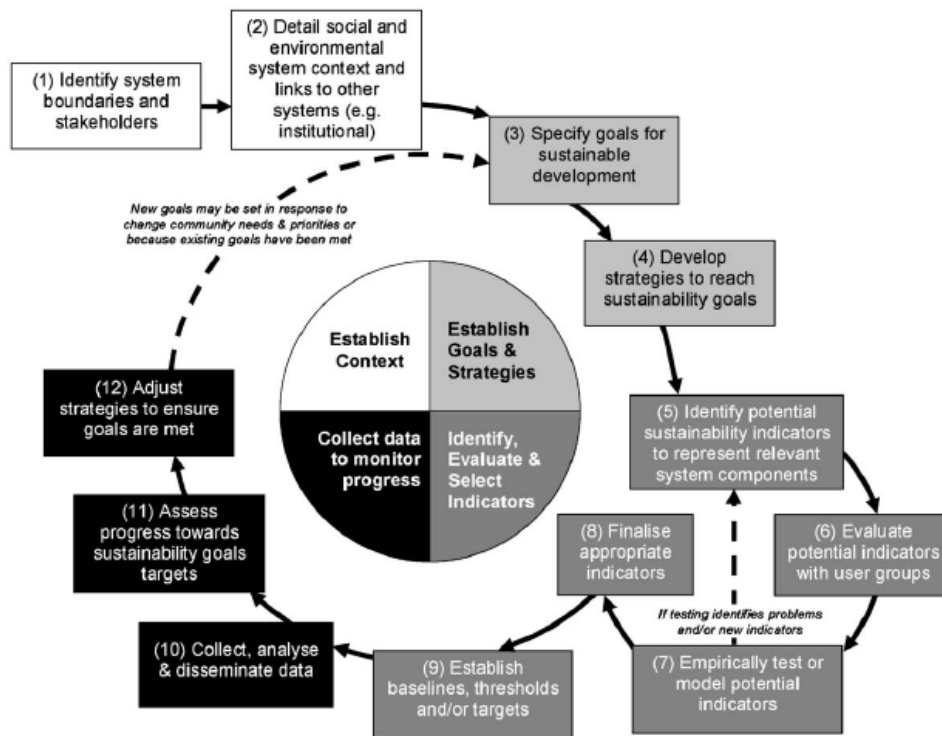

Figure (2-2): Adaptive learning process for sustainability indicator development and application. Source: (Mark Reed, Evan D. G. Fraser et al. forthcoming, p9)

The process outlined in Figure (2-2) can be viewed as an integration of different methods to accomplish the same task. It is suggested that the process of developing SIs should start by defining stakeholders, systems of interest, problems, goals and strategies through qualitative research. Relevant qualitative and quantitative methods should then be chosen to identify, test, select and apply SIs. This leads to an integrated series of general steps and specific methods that are evaluated using data from

different sources, using a range of different methods, investigators and theories. The inclusion of both bottom–up and top–down stages in the proposed process is vital in achieving the hybrid knowledge required to provide a deeper understanding of environmental, social and economic system interactions that are required to provide more informed inputs to local sustainable development initiatives.

Allied to the 'integrated methodology' paradigm is the concept of **Social Multi-Criteria Evaluation (SMCE),** developed by Munda, details are in (Munda 2004). The SMCE calls for a decision-making process using information coming from multi/inter disciplinary work and participatory approaches. Therefore, the problem is structured in a multi-criteria fashion considering several perspectives. An application of this approach can be found in Gamboa (forthcoming), where evaluation criteria have been derived from the identified needs and expectations of the different socio-economic and institutional actors. These criteria are measured by a set of index/indicator, which encompasses qualitative and ordinal evaluation to evaluate the several alternatives. Gamboa concludes that by means of both participatory approach and multi/inter-disciplinary work , a better comprehension of the different aspects of the problem will definitely happen (Gamboa forthcoming, p12).

In the context of sustainability assessment the concept of SCME can be very relevant. The SMCE principles as shown in Figure (2-3) can be synthesized as follows (Munda 2004, p674):
• The use of a multi-criteria framework is a very efficient tool to implement a *multi/inter-disciplinary* approach.
• *Science* for policy implies a *responsibility* of the scientists towards the whole society and not just towards a mythical decision-maker.
• *Public participation* is a necessary component but not a sufficient one. Participation techniques are seen as a tool for improving the knowledge of the problem at hand and not for receiving inputs to be used uncritically in the evaluation process. Social participation does not imply lack of responsibility.
• *Ethical judgments* are unavoidable components of the evaluation exercise. These judgments heavily influence the results. As a consequence, *transparency* on the assumptions used is essential.

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- In this framework, *mathematical aggregation* conventions play a significant role, i.e. to assure that the rankings obtained are *consistent* with the information and the assumptions used.
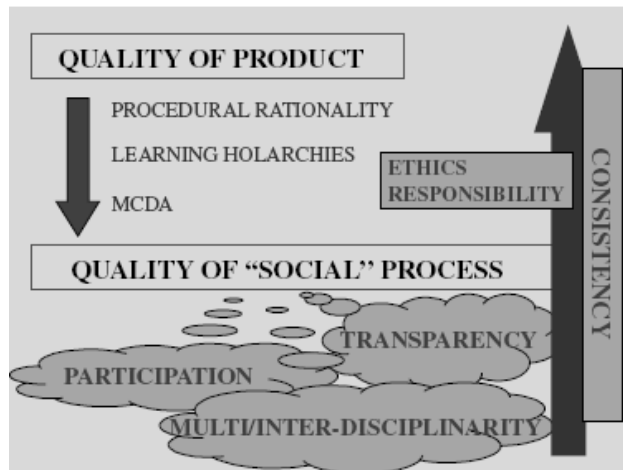

Figure (2-3): Synthesis of Social Multi-Criteria Evaluation (SMCE) Process. Source: (Munda 2004, p 674)

This research fits within the 'adaptive learning process' or 'integrated methodology' paradigm and its allied concept of the SMCE. It agrees with the possibility of building on the strengths of both top–down 'reductionist' and scientific methods as well as bottom–up, community-driven 'participatory' methods, with emphasis on the significant role of the SMCE in problem framing. Therefore, the integration of approaches from different methodological paradigms can produce more *relevant* and *accurate* results.

2.4 Conclusion

Sustainable development is perceived to be a guiding concept and an integrative process to guide the development process on the right route. The current dilemma facing the different interests in sustainable development concept falls principally in how to translate the concept into principles and how to establish new patterns and processes of development which are more sustainable.

SIs are widely considered to be a useful and possibly vital element in furthering the concept of sustainable development. They proved to be a

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crucial guidance tool for decision-making in a variety of ways. Moreover, SIs are perceived as an appropriate assessment tool that can capture the neglected dimensions in the HDI, given that the HDI is a widely well known tool for assessing development achievements.

The main purposes of SIs are to simplify complex systems and reduce the volume of information to a workable level for decision-makers. However despite its popularity, SIs are faced by some critical criticisms. Opponents argued that SIs attempt to encapsulate complex and diverse processes in a relatively few simple measures. On the other hand, proponents responded that this is not a new problem and people have to simplify to survive. The issue of simplification is critical. Simplification that masks reality or misses crucial issues is completely rejected. The required simplification is the one that can capture the key issues and remain understandable and manageable by the intended users.

Investigating the methodological paradigms that formulate the literature on SIs indicated that they used to fall into two main paradigms; the 'Reductionist' and the 'Participatory' paradigms. Moreover, in the last few years the third paradigm the 'Adaptive Learning Process' or the 'Integrated Methodology' emerged, which calls for integrating approaches from different paradigms to offer a holistic approach for measuring progress towards sustainable development. It emphasizes the importance of participatory approaches setting the context for sustainability assessment at local scales, as well as stressing the role of expert-led methods in indicator evaluation and dissemination. Allied to the third paradigm is the concept of SMCE, which calls for a decision-making process using information coming from multi/inter disciplinary work and participatory approaches.This research fits within the 'adaptive learning process' or 'integrated methodology' paradigm and its allied concept of the SMCE. A justification of the adopted theoretical paradigm will be explained further in chapter 6.

The next chapter explores the application of SIs in practice and highlights gaps in the process, which need more attention while carrying out any attempt for developing a SIs set for a particular context.

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Chapter (3): Sustainability Indicators Application in Practice

Introduction

Much work has been carried out by various organizations and institutions to develop sets of indicators in order to measure progress towards sustainability. However, to what extent these projects succeeded in fulfilling the main purposes for which they have been established and what are the drawbacks of their practical implementation, are what this chapter attempts to investigate.

This chapter aims to explore the key issues related to the application of SIs in practice. It examines a number of projects, which attempted to develop sets of SIs on various scales; global, national, regional and local to provide practical examples of the different approaches and frameworks used for formulating the indicator sets. The aim of this examination is not to evaluate the sets individually, or to say that a definitive approach can be identified, but rather to provide practical examples of the different approaches and frameworks used for formulating the indicator sets, highlight pitfalls and problems facing such kind of projects, point out to the areas where projects fail to fulfill the guidelines and conclude general lessons from them.

The examination reveals gaps in modelling the issues and addressing the linkages between the system components in the majority of projects. Therefore, the research explores the 'Systems Thinking' approach and its tools, as it seems a valid tool to fill this gap and improve our understanding of the system structure.

3.1 Guidelines of Practical Procedures for developing SIs

Bossel stresses the urgent need for comprehensive indicator sets that assess system viability, performance and sustainability in management for sustainable development at all levels, from the global to the village[2]

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[2] In this context, "viability" means the ability to survive and develop, and "Performance" refers to functions extending beyond mere viability requirements.

(Bossel 2001). He identifies several distinct steps of a practical procedure for finding appropriate indicators as follows:

- *Obtaining a conceptual understanding of the total system:* having a realistic understanding of the total system and its essential component systems is crucial to find indicators that represent the viability and performance of systems and their component systems. This requires a conceptual understanding in the form of at least a good model.

- *Identifying representative indicators:* selecting a small number of representative indicators from a vast number of potential candidates in the system and its component systems. This means concentrating on the variables of those component systems that are essential to the viability and performance of the total system.

- *Assessing performance based on indicator states:* finding measures that express the viability and performance of component systems and the total system. This requires translating indicator information into appropriate viability and performance measures.

- *Developing a participative process:* The previous three steps require a large number of choices that necessarily reflect the knowledge and values of those who make them. In holistic management, it is therefore essential to bring in a wide spectrum of knowledge, experience, mental models, and social and environmental concerns to ensure that a comprehensive indicator set and proper performance measures are found.

It can be clearly recognized that Bossel's guidelines are very compatible with the third theoretical paradigm for formulating the literature of SIs that was explained in section 2.3.3: the 'Adaptive learning process' paradigm. Both have similar foundation and advocate the middle position. However, to what extent these guidelines are employed in practical schemes, is what the following section sought to explore.

3.2 Key themes in projects of developing SIs in practice

There is a wide range of projects that have addressed the indicators issues. Since the research is focused on SIs, it was decided that only these indicators which were explicitly formulated to measure sustainable development would be considered for analysis, and the others which are designed to measure a specific issue such as 'sustainable economy' or 'sustainable society' have been excluded. By reviewing a number of these projects, key themes are extracted to formulate the discussion of crucial issues that should be covered by such kind of projects. The key themes can be summarized as follows:

- Purposes of the project
- Definition of sustainability goals (values and vision)
- Appropriate number of indicators
- Target audience (users)
- Selection of indicators (who involved in this process)
- Suitable framework for organizing the indicators
- Assessment techniques

The study sample includes 5 projects for developing indicators to assess progress on the path of sustainable development as shown in Table (3-1). Appendix (A) contains a summary of the indicators list used in each of them and the adopted framework for organizing the indicator sets. To narrow the scope of selection, a number of criteria have been identified to be determined in the study sample as follow:

- Provide multiple scales of data collection, such as UN-CSD set (UNCSD 2001) (global), UK set (DEFRA 2005) (national), and Seattle set (Sustainable Seattle 1998) (local),
- Use different frameworks for organizing the indicator sets. Such as the UN-CSD "Driving Force-State-Response" framework which evolved afterwards to the "Theme, Sub-Theme" framework, the US-SDI (U.S. Interagency Working Group on Sustainable Development Indicators 1998) used the "Long term endowments & liabilities, Processes, and Current Results" framework and Minneapolis (Crossroads Resource Center 1999) used the "Goal-Indicator matrix" framework,
- Use various methods in assessing progress towards sustainable development. For example, UK used the 'Trend' concept; an indicator either moves toward or away from sustainability or

Name of Producers	Scale of data	Name of Publication	Date	No. of ind.	Organizing Frameworks
United Nations Commission on Sustainable Development (UNCSD)	Global	Indicators of sustainable development : guidelines and methodologies	2001 results of a work program 1995-2000	58 based on a working list of 134 ind.	The framework used evolved from a Driving Force – State – Response approach to one focusing on Themes and Sub-Themes of sustainable development
U.S Interagency Working Group on Sustainable Development Indicators, Washington, D.C.	National	Sustainable Development in the United States: An Experimental Set of Indicators	December 1998	40 from a list over 400 ind.	Indicators are organized via 3 types of frameworks. The first one is the main one: • Long term endowments & liabilities, Processes, and current results framework; • Economic, Environmental and Social framework; and • Multiple views of indicators framework, which combines the preceding 2 frameworks
The Department for Environment, Food and Rural Affairs (DEFRA) & National Statistics	National	Sustainable development indicators in your pocket 2005 (A baseline for the UK Government Strategy indicators)	2005	68 ind.	Indicators are organized to represent four priority areas for action: • Sustainable consumption and production • Climate change and energy • Protecting natural resources &enhancing the environment • Creating sustainable communities and a fairer world.
Sustainable Seattle A volunteer citizens group with diverse backgrounds	Local	Sustainable Seattle's Indicators of Sustainable Community	1998 (3rd edition)	40 ind. from a list of 99 ind.	Indicators are organized according to the major themes or issues identified by stakeholders that may influence movement towards or away from sustainability.
Crossroads Resource Centre /Urban Ecology Coalition – Minneapolis, Minnesota	Local	Neighborhood Sustainability Indicators Guidebook	February 1999	From 10 to 25 ind. According to the ind. type	Indicators are organized using the goal – indicator matrix in four different types; 1. Data Poetry Ind. 2. Core Ind. 3. Background Ind. 4. Deep Sustainability Ind.

Table (3-1): Description of the study sample projects

remains neutral. Minneapolis examines the indicator linkage to the Neighborhood's goals, using a check list for each indicator link with specific Neighborhood's goals as an assessment method. UN-CSD used the 'Target' concept where indicators were associated with the established goals and targets of Agenda 21.

Fit within different methodological paradigms: for example, Seattle and Minneapolis sets of indicators fit within the 'Participatory' paradigm, while the others fit within the 'Reductionist' paradigm.

The study sample of projects is analyzed with respect to the extracted key themes as follows:

3.2.1 Purposes of the project

The common purpose amongst all the entire projects of the study sample is to *monitor progress towards sustainable development* along with some secondary purposes, which differ from one project to another. These purposes can be summarized as follows:

- Informing decision making
- Early warning system
- Raising awareness of sustainable development and increasing understanding
- Improve policies and their implementation, and facilitate regular monitoring and reporting on the state of the environment and development process or
- Stimulate further thought and discussion on which measures are most useful in assessing progress.

Identifying the purpose of developing the indicator set is crucial from the outset of the project, as other significant decisions will be built upon it, such as specifying the target audience, the appropriate number of indicators, the suitable framework, etc.

3.2.2 Definition of sustainability goals (values and vision)

For the issue of defining sustainability, some of the study sample projects, such as Minneapolis and Seattle referred to the WCED (Brundtland) definition, while others developed their own definition of sustainability, such as US-SDI. Generally, all definitions supported the

ideas of integrating social, economic and environmental priorities, but there is minor consideration of the concept beyond this.

Relating indicators back to sustainability goals is crucial if indicators are to measure progress towards sustainable development. Obviously, this requires that the goals have to be clearly expressed and form the basis of what exactly is to be measured.

Within the study sample context, some projects succeeded in relating the indicators back to the goals, such as Minneapolis, which adopted a very simple framework. Although they developed four core sets of indicators to respond to different needs and audiences but all the sets are organized in respect to their linkage to neighborhood's concerns and goals using a goal – indicator matrix. Others did this badly, for example, the US-SDI used a complex and technical framework, which organizes indicators in a very rigid manner. As a result, relating indicators back to the goals of sustainability is relegated to a secondary level of importance. Therefore, it can be noticed that there is a cogent relationship between the adopted framework and relating indicators back to sustainability goals, and failing to do this is one of the main disadvantages of frameworks, which will be discussed in detail further.

3.2.3 Appropriate number of indicators

A substantial number of indicators are necessary to capture all the important aspects of sustainable development in a particular application (Hardi and Zdan 1997). However, defining an appropriate set of indicators for sustainable development is a difficult task. If too few indicators are monitored, crucially important development issues may escape attention. If a large number of indicators have to be examined, data acquisition and data analysis may become prohibitively expensive and time-consuming. Obviously, practical schemes cannot include indicators for everything. It is therefore essential to define a set of representative indicators that provide a comprehensive description, or as many as are essential, but no more (Bossel 2001).

Within the study sample context, the issue of the appropriate number of indicators has been addressed in all of them. Usually, at the beginning, during brainstorming session, it started with a vast number of indicators

then after revising and refining the proposed set, it is reduced afterwards. For example, UN-CSD started with 134 indicators and ended with 58 indicators, US-SDI started with 400 indicators and ended with 40 indicators, and Seattle's group started with 99 and ended with 40 indicators. Deciding how many to keep can be difficult. More is not better, less is not better. It can be recognized that while it is vital that all goals and issues are covered, it is also essential that there are not too many indicators: the more information that is provided the more difficult it is to take it all in. The right number depends on many factors including what type of audience the indicator report will have, how much time is available to research the data, the number of issues involved, and any specific needs of the concerned society or community. Hart added that, if the indicators are to be used by different departments within large organizations, 50 to 100 might make sense. If the indicators were to be used to keep the public informed, a smaller number of 10 to 20 would make more sense. What is crucially important is that the final set of indicators cover all the issues that are important to the community (Hart 2000). The number of SIs in the projects sample varies between 25 (Minneapolis) and 68 (UK).

3.2.4 Target audience (Users)

It is fundamental to decide who the target audience is at the beginning phase of any project for developing SIs, so that their needs can be addressed and this strongly related back to the purposes of developing the SIs sets. Percival assumed that if different users are looking for different things in an indicator such as, scientific validity for professionals, policy relevance for politicians, and ease of understanding and personal relevance for the public, then not all will be satisfied by the same set of indicators (Percival 1997). It is then the case of either having different sets of indicators for different audiences, or deciding which audience has the priority.

For example, planners need indicators in order to learn about and to assess the existing development trends and to be able to quantify arguments for planning and development policies. For decision-makers, indicators can be an essential accounting tool for tracking developing trends including the impact of policy measures. Furthermore, indicators can serve as a useful feedback instrument for raising a sense of

responsibility amongst decision-makers. For the broad public, indicators are a means to better understand the development processes and trends in their community in the context of sustainable development (Abolina and Zilans 2002, p307).

Within the study sample context, the target audience differs from one project to another. For example, UN-CSD directed its set to decision and policy makers, Seattle's group and US-SDI gave equal importance to both policy makers and the public, Minneapolis was mainly concerned with neighborhood citizens, while the UK directed its set to experts and others who are less familiar with the concept of sustainable development. All of them except Minneapolis produced a core set of indicators to be used by all users. Only Minneapolis organized its indicators using the same framework (goal – indicator matrix) but in four different types of sets. Their argument is to better respond to different needs, and maximize the usefulness for different audiences.

The author believes in the importance of identifying the target audiences is to address their specific needs rather than to develop different sets of indicators for different groups. If different groups used different sets of indicators, then there will be no consensus on the level of study whatever, global, national or local. Within the context of this research, it is recommended to have one core set of indicators to be shared by everyone, with the reservation that everyone also should share the same goals which they related to. Definitely, there would be a trade-offs to satisfy the different groups. The decision of whose needs would get priority has to be considered at the outset of the project.

3.2.5 Selection of indicators (who involved in this process)

If indicators are meant to represent the interests of all and be used by all, then it is important to consider who should be involved in the selection process. Since indicators effectively define what is good and bad, it is important that they are chosen very carefully. It can be noticed through reviewing the study sample, that the public are only involved at the local scale (Seattle and Minneapolis), while the other projects that represent global or national scale (UN, UK and US), indicators are chosen by experts and professionals with no influence from the public. At the local level, priority is given to stakeholders needs, while at the global and

national level priority is completely given to policy relevance. It can be noticed also that both of (Seattle and Minneapolis) fit within the 'Participatory' paradigm which emphasizes the importance role of people in setting goals, establishing priorities and selecting indicators, while the others fit within the 'Reductionist' paradigm which emphasizes the importance of the scientific experience in selecting relevant and reliable indicators using statistical tools. The coherent relationship between the scale of study (global, national, or local), the adopted methodological paradigm and the involved groups for selecting the indicators can be clearly recognized.

3.2.6 Suitable framework for organizing the indicators

The main function of frameworks is to organize indicators in a meaningful way using a conceptual structure, so indicators emerge more naturally, and can be adjusted to the needs of a given locale or decision-makers (Hardi and Zdan 1997). Although using a clear conceptual framework for guiding the assessment process is very important, it has also some drawbacks which affect its function negatively.

There are four types of frameworks for organizing the indicators that can be recognized in the study sample, as follows:

1. **The Goal-Indicator Matrix** framework (Minneapolis), which is useful for showing whether the indicator set measures all the goals of a community and whether all issues or goals are evenly addressed. It is easily understood by many people; however it doesn't address the linkage between social, economic and environmental issues.

2. **The Driving Force-State-Response (DFSR)** framework (the first one used by UN-CSD). This framework is derived from the Pressure-State- Response (PSR) family, which is the most well known within the different types of frameworks. PSR framework was originally devised to report on the state of the environment and was subsequently widely promoted by the OECD (1993). It is based on the following principles:

*   Human activities create *pressure* on the environment,
*   These lead to alterations in the *state* of the environment,

- Policy or management *responses* are then adopted to mitigate or control undesired impacts and protect the environment.

PSR framework despite its simplicity, easiness and widely applicability to be used in many situations, has its own failings. It is mainly criticized by the following:

- Its linearity in the way it describes the links between human activities, environmental conditions and policy interventions. In addition, it shows linkage only within single issues, while the other links between issues are completely neglected (David J.Briggs and Connelly 2000, p 18) .

- Its subjectivity in the way the indicators are fitted under the P-S-R categories. The ability to interpret the same or similar indicators in very different ways within the PSR framework can be noticed, especially in the UN-CSD set.

- Its negligence of the positive aspects. It assumes that all human activities are pressures, i.e. negative, while in reality they can be either negative or positive (Mark Reed, Evan D. G. Fraser et al. 2005) .

- Its failure to relate indicators back to the main goals of sustainable development and policy relevance as the main focus is on fitting the indicators under the (P-S-R) categories, and this was the main reason behind the evolution of the Theme-Sub Theme framework in the UN-CSD.

In the light of the growing dissatisfaction with the PSR model, several alternatives and extensions to the framework have been proposed recently. The main versions can be summarized as follows:

- *The Driving Force-State-Response (DFSR)*, which mainly replaced pressure with driving force to consider both positive and negative aspects but with no consideration of the other defects. An example can be found in the UNCSD (2001).

- *The Pressure-State-Impact-Response (PSIR),* which added a category of *impact* indicators to better capture the impact and effect of human activity on environmental conditions, and vice versa. An example can be found in Segnestam, Winograd et al. (2000).

- *The Driving Force-Pressure-State-Impact-Response (DFPSIR),* which provides a more sophisticated framework for structuring indicators. It combines the advantages of the DFSR and PSIR

frameworks, but with no consideration to the other disadvantages of the PSR, an example can be found in Ukranie (1998).

None of the extension frameworks derived from the PSR framework could alleviate all the problems that were identified before. Each one attempted to fill a gap with respect to the requirement of the specific project that it is designed to organize its indicators, but other gaps still exist.

3. **The Theme - Sub Theme** framework (UN-CSD) can also be called the category or issue framework. It adopted by the UN after evolving from the DFSR framework due to its failure to relate the indicators to the policy issues or the main themes related to sustainable development. This is carried out based on the conclusion of the testing countries that the DFSR framework although suitable in an environmental context was not as appropriate for the social, economic and institutional dimensions of sustainable development**.** The theme framework has been developed to address the following considerations: future risks; correlation between themes; sustainability goals; and basic societal needs.

Notwithstanding, the Theme – Sub Theme framework attempted to alleviate the disadvantages of the DFSR framework, it fails to address the linkage between the key themes of sustainable development. The developers of the framework admit that the organization of themes and sub-themes within the four dimensions (social, environmental, economic, and institutional) of sustainable development represents a 'best-fit' to guide the selection of indicators. This does not mean that issues should be considered exclusively within only one dimension. For example, poverty is categorized only as a social sub-theme, though it has obvious and significant economic, environmental, and institutional linkages. In fact, the absence of addressing the linkages is one of the major disadvantages of the Theme – Sub Theme framework. The restriction of fitting each issue under only one category precludes the function of frameworks as a meaningful tool to organize indicators.

4. **The Long Term Endowments & Liabilities, Processes, and Current Results**[3] framework is adopted by the US-SDI. It is primarily developed to capture the longer-term aspects of sustainability. It is built on the PSR model, but it accommodates a range of processes related to the economy, the environment, and the society. It divides the "state" category in the PSR model into two separate categories: "long-term endowments and liabilities" and "current results". This division emphasizes the multi-generational nature of sustainability. The US-SDI framework also builds on the familiar economic concept of stocks and flows. One can sometimes think of processes as the activities that utilize initial stocks to yield current goods and services, as well as the resulting stocks that are passed on to future generations. The main objective of this categorization is to reflect the multidisciplinary, intergenerational, and evolving nature of sustainable development. It is probably excellent at ensuring that all topics are considered but its complexity makes it unwieldy and difficult to understand or use. Similar to the other frameworks, the issue of linkages between the different dimensions is poorly considered and the obvious tendency towards fragmentation and compartmentalization can be easily recognized. The only linkage that is emphasized in the US-SDI set is between the indicator itself and the rationale of the category it is listed under.

It can be concluded from the analysis of the study sample projects that there is no ideal framework; each framework has advantages and disadvantages. A common gap in all frameworks is their failure to capture the linkages between the main issues of concern. This gap is also addressed by Percival in his conclusion about frameworks:

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[3] **Long-Term Endowments & Liabilities** = The assets, resources, capacities, and liabilities inherited from our predecessors and from nature and passed on to future generations
Processes = General processes such as human activities that utilize assets and resources (endowments) to yield current goods and services; general Earth system processes; general social, cultural, or political processes; driving forces arising from human or Earth system processes that directly affect the condition of long-term endowments; and decision-making processes that utilize information about current results, endowments, or driving forces and affect human activities
Current Results = The goods, services, and conditions enjoyed or experienced by current generations. The emphasis is on the present, rather than on the future.

"Frameworks can be useful for ensuring that all issues and topics are covered or given consideration, but their role should probably end here. When they are used beyond this function they tend to fragment and compartmentalize things, ignoring or minimizing linkages between connected issues. Many assert that indicators should form a whole and linkages should be clearly outlined, but all that happens in practice is that it is noted where a change in one indicator might be accompanied by a change in another."
(Percival 1997, p101)

Although almost all of the projects emphasized the crucial need of a framework to organize the indicators, the analysis did not show this necessity. On the contrary, it is apparent that attempts to fit indicators below the listed categories limited the success of frameworks and created more defects such as difficulties in relating the indicators back to sustainability goals and addressing the linkages between key issues. It can be inferred that the task of selecting the appropriate indicators, which represent the main issues of concern is essential, while organizing them into a suitable framework could take many forms. Evidence for this is provided by Segnestam, Winograd et al. (2000), while developing indicators in the "Rural Sustainability Indicators for Central America" project, the same set of indicators have been organized in three different frameworks to suit the different needs through the different phases of the project as follows:

1. According to different sustainable development components (social, economic and environmental),
2. According to sectors, a framework structured around rural sustainability issues (such as land-use, deforestation, infrastructure, and natural events), and
3. According to category, using a Pressure-State-Impact-Response (PSIR) framework.

3.2.7 Assessment techniques

Once a set of SIs has been agreed upon, they have to be measured. Obtaining the value of the indicator may be a relatively easy task if good quality data is already available, or if the means of getting such data is

already well established (Bell and Morse 1999, p28). Showing progress or decline on the path of sustainability can be based either on values of individual indicators or a value of a single composite indicator. A distinction of individual indicator from composite indicator is that the individual indicator is the basis for evaluation in relation to a given objective, while a composite indicator is an aggregation of more than one dimension, objective, individual indicator or variable (Munda 2005, p119).

Assessment techniques based on values of **individual indicators** use either the concept of *'Trend'* , *'Target'* or *'Threshold'* to indicate the performance of the measured system. Targets are specific endpoints that should be established at an early stage and have to be reached by a specific time, while thresholds are limits that provide an early warning, if the indicator goes above or below one of these thresholds then a remedial action is triggered. When identifying a target or threshold is a difficult task, as they are meaningless unless there is an idea of what range equates to sustainability (Bell and Morse 1999, p30), establishing some sort of baseline or reference point can be helpful. This is essential to permit observation and gauging of the significance of change which may then trigger some action. Baselines are important reference points as they provide a starting point to measure change from a date or a state (Riley 2001, p 246). The notion of the *'Ideal or Leader Value'* is a good example of a baseline concept. It is a well established technique in *multi-criteria evaluation* literature, examples can be found in (Zeleny 1982; Yu 1985) cited in (Munda 2005, p127). The leader value can be defined by choosing the best value reached in any single indicator within the scope of assessment. The advantage of assessing performance based on the values of individual indicators is to provide clear and useful information on the behavior of the single indicators, while the disadvantage falls in the difficulty of usage by decision-makers if comparison between a huge numbers of entities is required.

Assessment techniques based on the value of a **composite indicator** or **index** use the concept of 'rank' to indicate the performance of the measured system. The notion of a single composite index of sustainable development, though it is attractive and has a definite appeal, could be very dangerous. The attractiveness lies in the easiness and the possibility

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of comparison between different countries, cities or regions, which are favored by decision and policy-makers. On the other hand, the dangerousness mainly falls in its implicit position towards compensability. *Compensability* refers to the existence of trade-offs, i.e. the possibility of offsetting a disadvantage of some criteria by a sufficiently large advantage of another criterion. For example in a sustainability index, economic growth can always substitute any environmental destruction or for example inside the environmental dimension, clean air can compensate for a loss of potable water (Munda 2005, 128).

Examples of how both assessment techniques are employed in practical schemes are illustrated in the following section. All the projects included in the study sample fit within the first technique: assessment based on the value of individual indicators. Moreover, they only vary between either the trend or target concepts. Therefore, additional examples are explored to provide a comprehensive overview of the usage of the two techniques.

3.2.7.1 Assessment techniques based on the values of individual indicators

Within the context of the study sample, the concept of "*Trend*" is employed in the UK, Seattle, and US-SDI sets. Both the UK and Seattle measured their progress according to the trend of indicators either moving towards or away from sustainability. Sustainability here means a favorable direction not a value or destination. Seattle compared its latest data, the 1998 values for each indicator to the similar ones for its past two editions 1990 and 1995 and whether each indicator shows improvement or deterioration comparing to its past values.

In the UK set, the assessment of progress has been made by comparing the latest data with the position at two baselines:
* Since 1990 (medium-term change)
* Since 1999 (short-term change)

They used a set of "traffic lights" to indicate the results. For most indicators it was very clear whether there has been an improvement or deterioration, and hence whether a green or red traffic light is warranted. However, where the amounts of change are small it was difficult to judge whether they are sufficient to indicate that there has been a clear improvement or deterioration. So as a basic rule of thumb where an

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indicator value has changed by less than 3 per cent, the traffic light has been set at amber, indicating little or no change. The choice of 3 percent as the threshold is arbitrary but has proven to be helpful in deciding on the most appropriate traffic light.

The US-SDI considered their set of indicators as an experimental set that can be used for a comparative qualitative assessment to determine if the nation is at least proceeding in the right direction on the path of sustainable development. In such an assessment, the number of indicators showing a positive trend can be compared to the number showing a negative trend. If the net difference is positive, this would be a general indication that the nation is moving in the right direction. The length for data time series, which is used to indicate the changes in trend for each indicator started with the 1970 data and ended with the most current data available.

The concept of "*Target"* is employed in the UN-CSD set. Measurements of indicators were associated with the established goals and targets of Agenda 21. For example, the theme of equity under the social category is divided into two sub-themes, poverty and gender equality. One of the indicators to measure poverty is the percentage of population living below the poverty line. The target used is reducing the proportion of population living in extreme poverty in developing countries by half by 2015.

The concept of the *"Leader Value"* is employed in Munda (2005). Munda established an illustrative example regarding four cities; two belong to highly industrialized Countries (Amsterdam and New York) and two belong to transitional economies (Budapest and Moscow). He attempted to assess their sustainability achievement based on a set of nine sustainability indicators as shown in Table (3-2). In this technique, a normalization rule known as '*distance from the leader value'* is applied, which assigns 100 to the maximum value (leader) and other values are ranked as percentage points away from the leader.

Criteria	Budapest	Moscow	Amsterdam	New York	Leader value
A- City product per person (US$/year)	4750	5100	28251	30952	30952
B- Use of private car (%)	31.1	10	60	32.5	10
C-Solid waste generated per capita (t./year)	0.2	0.29	0.4	0.61	0.2
D- Houses owned (%)	50.5	40.2	2.2	10.3	50.5
E- Residential density (pers./hectare)	123.3	225.2	152.1	72	72
F- Mean travel time to work (minutes)	40	62	22	36.5	22
G-Income disparity (Q5/Q!)	9.19	7.61	5.25	14.81	5.25
H- Households below poverty line (%)	36.6	15	20.5	16.3	15
I- Crime rate per 1000 (theft)	39.4	4.3	144.05	56.7	4.3

Table (3-2): Impact matrix of the four chosen cities according to selected Indicators

In this example, the indicators 'houses owned' and 'city product per person' have to be maximized while all the others have to be minimized. By applying this technique to the indicator scores of the four cities (taking into account that when the objective is minimized the leader is the city with the lowest indicator score), results are obtained in Table (3-3). The numerical results are synthesized and presented graphically to make their interpretation easier by using the so-called *"Radar Diagrams",* where the ideal city reaches the score 100 on any indicator. Radar diagram is a tool that provides a visual display of the current state or level of performance in various assessment factors (i.e. the indicators within this research context). It proved to be a valid tool to visualize changes and enable relative comparisons across a number of cases (Campbell 2001; Schultz 2003). It is a radial diagram, where each indicator is represented by an axis. A radar diagram positions the score of each indicator by a dot on the axis. The lowest score is shown close to the centre of the diagram, and the highest score is shown on the diagram's perimeter. The joining up of scores does not imply a particular relation between them, but produce a graphical image that creates a user-

friendly picture of the scores. Radar diagrams can be established manually or computerized. An example of the results of two cities (Amsterdam and New York) is presented in Figure (3-1a, 3-1b).

Criteria	Budapest	Moscow	Amsterdam	New York
A- City product per person (US$/year)	15.35	16.48	91.27	100.00
B- Use of private car (%)	32.15	100.00	16.67	30.77
C-Solid waste generated per capita (t./year)	100.00	68.97	50.00	32.79
D- Houses owned (%)	100.00	79.60	4.36	20.40
E- Residential density (pers./hectare)	58.39	31.97	47.34	100.00
F- Mean travel time to work (minutes)	55.00	35.48	100.00	60.27
G-Income disparity (Q5/Q!)	57.13	68.99	100.00	35.45
H- Households below poverty line (%)	40.98	100.00	73.17	92.02
I- Crime rate per 1000 (theft)	10.91	100.00	2.99	7.58

Table (3-3): Benchmarking exercise by using the distance from the leader method
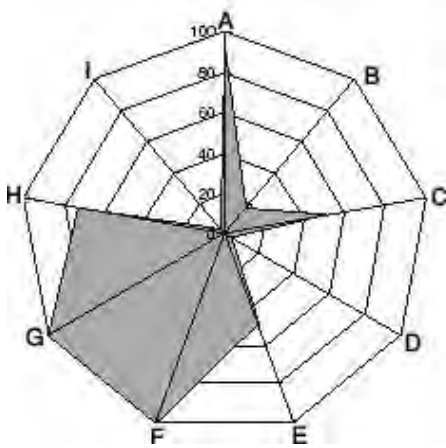
Figure (3-1a): Radar diagram for Amsterdam sustainability benchmarking.	Figure (3-1b): Radar diagram for New York sustainability benchmarking.
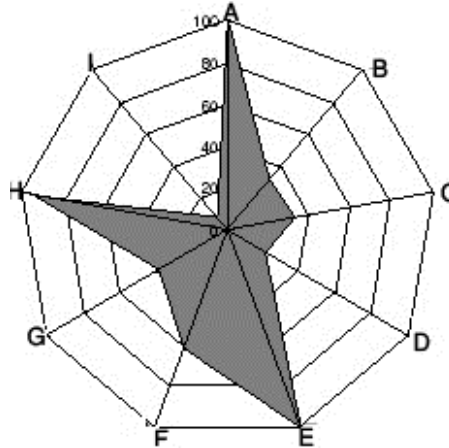
Finally, with regard to assessment techniques within the study sample projects, Minneapolis used indicators to help determine what conditions

exist and whether the direction the neighborhood is headed in is consistent with community goals. The progress measurement was according to the indicator linkage with the Neighborhood concerns & goals. Indicators are listed in one column and Neighborhood's goals in the opposite columns. Then using check off for each indicator links with specific Neighborhood's goals. The more checks an indicator receives, the more highly linked it is, and the more it seemed to express an integrated vision for the community.

3.2.7.2 Assessment techniques based on the value of a composite indicator

Munda argued that sustainability assessment[4] needs a set of multi-dimensional indicators and raises the question of how could such indicators be aggregated? Often, some indicators improve while others deteriorate (Munda 2005).

He explained 3 different mathematical methods and approaches for ranking by the value of a sustainable development index. Each of them has its advantages and disadvantages. The mathematical techniques will not be fully illustrated due to their complexity; moreover, the main aim is to explore the different possible methods for aggregating the indicators rather than investigate the algorithm behind each of them. By using the same example of the 4 specific cities, he attempted to rank them by constructing a single composite indicator via 3 different mathematical techniques as follows:

- **First method of ranking: The linear aggregation rule**

In this technique a typical composite indicator, I is built up as follows (OECD 1993, p5) cited in (Munda 2005, p121).

$$I = \sum_{i=1}^{N} w_i x_i, \quad (1)$$

Where xi is a normalized variable and wi a weight attached to xi, with $\sum_{i=1}^{N} w_i = 1$ and $0 \leq$ wi ≤ 1, i = 1, 2, . . . , N. From a mathematical point of

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[4] By assessment here is meant the ranking of countries, cities or regions and their benchmarking.

view, a composite indicator entails a weighted linear aggregation rule applied to a set of variables. The main technical steps needed for its construction are:

1. Standardization of the variables to allow comparison
2. Weighted summation of these variables

To standardize variables, the "distance from the best and worst performers" technique is applied, where the maximum value is given as 100 (leader) and the minimum value is given as 0 (laggard) and the rest of the values are between 0 and 100. The utilized equation is:

$$100 \left(\frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}} \right) \qquad (2)$$

As for weights, all the indicators are considered as having the same importance to alleviate the trade-off amongst the different issues. By applying equation (2) to the values contained in Table (3-2), the results presented in Table (3-4) are obtained.

Criteria	Budapest	Moscow	Amsterdam	New York
A- City product per person (US$/year)	0	1.335	89.691	100
B- Use of private car (%)	42.2	0	100	45
C-Solid waste generated per capita (t./year)	0	21.95	48.78	100
D- Houses owned (%)	100	78.674	0	16.77
E- Residential density (pers./hectare)	33.485	100	52.28	0
F- Mean travel time to work (minutes)	45	100	0	36.25
G-Income disparity (Q5/Q!)	41.213	24.686	0	100
H- Households below poverty line (%)	100	0	25.462	6.018
I- Crime rate per 1000 (theft)	25.116	0	100	37.495

Table (3-4): Normalized impact matrix

In the above example, the indicators 'houses owned' and 'city product per person' have to be maximized while all the others have to be minimized. To normalize indicators for minimizing objectives, it is thus necessary to transform the indicator scores of these indicators by using the simple equation: (100 – normalized indicator score). By applying this equation to the values of indicators in Table (3-4), the results in Table (3-5) are obtained. By applying equation (1) to the transformed values, a SDI is constructed for each city and they could be ranked as shown in

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Table (3-5). By aggregating the normalized values, scores and ranks of the four cities can be obtained as shown in Table (3-5).

Criteria	Budapest	Moscow	Amsterdam	New York
A- City product per person (US$/year)	0	1.335	89.691	100
B- Use of private car (%)	57.8	100	0	55
C-Solid waste generated per capita (t./year)	100	78.05	51.22	0
D- Houses owned (%)	100	78.674	0	16.77
E- Residential density (pers./hectare)	66.515	0	47.72	100
F- Mean travel time to work (minutes)	55	0	100	63.75
G-Income disparity (Q5/Q!)	58.787	75.314	100	0
H- Households below poverty line (%)	0	100	74.538	93.982
I- Crime rate per 1000 (theft)	74.884	100	0	62.505
Aggregating scores (the SDI)	512.986	533.373	463.169	492.052
Ranks	**2**	**1**	**4**	**3**

Table (3-5): Normalized impact matrix accounting for minimization objectives and cities' ranks

- ***Second method of ranking: The Internal or ratio scale***

The second method used a simple ranking algorithm, more consistent than the linear aggregation rule, which is based on an *interval or ratio* scale of measurement. The mathematical aggregation convention can be divided into two main steps:

1. Pair-wise comparison of countries according to the whole set of individual indicators used.
2. Ranking of countries in a complete pre-order.

By applying this algorithm to the indicators profile showed in Table (3-2) and after passing through some mathematical equations, the resulted outranking matrix can be shown in Table (3-6).

	Budapest	Moscow	Amsterdam	New York
Budapest	0	4	4	5
Moscow	5	0	5	6
Amsterdam	5	4	0	3
New York	4	3	6	0

Table (3-6): Interval or ratio scale outranking matrix

Also in this case Moscow is in the top position. New York is better than Amsterdam. The position of Budapest with respect to both New York and Amsterdam is not well defined.

- ***Third method of ranking: The use of weights as importance coefficient***

In this method indicators are classified under three dimensions, i.e. economical, social and environmental, which are considered essential in any sustainability assessment as follows:

Economic dimension:	• City product per person
Environmental dimension:	• Use of private car
	• Solid waste generated per capita
Social dimension:	• Houses owned.
	• Residential density.
	• Mean travel time to work.
	• Income disparity.
	• Households below poverty line.
	• Crime rate.

Clearly, the social dimension is receiving implicitly a much bigger weight than any other dimension depending on the weighting (considering that six indicators over nine belong to this dimension).

A reasonable decision might be to consider the three dimensions as equally important. This would imply giving the same weight to each dimension considered and finally to split this weight among the indicators. That is, each dimension has a weight of 0.333; then the economic indicator has a weight of 0.333, the two environmental indicators have a weight of 0.1666 each, and each one of the six social indicators receives a weight equal to 0.0555. As one can see, if dimensions are considered, weighting indicators by means of importance coefficients is crucial. Munda examined this approach with the impact matrix at Table (3-2) to test if this weighting exercise provokes any change in the final ranking. The new outranking matrix is presented in Table (3-7).

	Budapest	Moscow	Amsterdam	New York
Budapest	0	0.3	0.4	0.4
Moscow	0.7	0	0.5	0.6
Amsterdam	0.6	0.5	0	0.3
New York	0.6	0.4	0.7	0

Table (3-7): Weighted outranking matrix

As one can see, Moscow is still on the top position, but this time Budapest is on the bottom one. New York scores again are better than Amsterdam.

Concluding, both of the measurement techniques either based on individual indicators or single composite indicator have advantages and disadvantages. Evaluation based on values of individual indicators provides clear vision about the real problems and highlight the leverage points which need policy interventions to improve the current conditions. However, it could lead to a vast amount of information, which limits its usage by decision-makers. Evaluation based on the value of a composite indicator would definitely imply a kind of compensability, which the concept of sustainability tries to avoid. However, it enables comparison if required and has a definite appeal especially for decision-makers. Choosing the appropriate evaluation technique depends on the purpose that it should fulfill and the users of the out coming results.

The next section provides an overview of the 'Systems Thinking' approach. It aims at investigating the appropriateness of using such an approach to tackle the problems that have been identified from the analysis of the practical application of SIs. This is principally, in terms of ignoring the complex linkage between the issues of concern and the tendency towards compartmentalization, which appeared clearly in the different frameworks employed within the study sample context.

3.3 Systems Thinking

A system can be defined as: "A group of interacting, interrelated, and interdependent components that form a complex and unified whole".

(Pegasus Communications Inc. 2000b)

Systems thinking is an approach for developing models to promote better understanding of events, patterns of behavior resulting in the events, and even more importantly, the underlying systematic interrelationships, which are responsible for the patterns of behavior and the events. It is very useful in addressing a particular situation with its underlying structure and identifying the most appropriate leverage points to effect change within the system (Bellinger 2004a).

3.3.1 Origins and Approach of "Systems Thinking"

Systems thinking has its foundation in the field of system dynamics, founded in 1956 by Professor Jay W. Forrester in Massachusetts Institute of Technology. Professor Forrester recognized the need for a better way of testing new ideas about social systems in the same way as the ideas in engineering can be tested. It is a mindset for understanding how things work. System dynamic is more or less the same as system thinking but emphasizes the usage of computer-simulation tools (Aronson 1998).

The approach of systems thinking is fundamentally different from that of traditional forms of analysis. Traditional analysis focuses on separating the individual pieces of what is being studied. The systems thinking, in contrast, focuses on how things being studied interact with the other constituents of the system. This means that instead of isolating smaller and smaller parts of the system being studied, systems thinking works by expanding its view to take into account larger and larger numbers of interactions as an issue is being studied (Aronson 1999; Gerald M. Weinberg 2001). This definitely fits within the notion of sustainability, as it emphasizes the need of integrating and examining system components together rather than in isolation.

3.3.2 Language and Terminology of 'Systems Thinking'

As a language, systems thinking has unique qualities. It emphasizes *circular feedback*: (for example, A leads to B, which leads to C, which leads back to A) rather than *linear cause and effect* (A leads to B, which leads to C, which leads to D, . . . and so on), as shown in Figure (3-2).
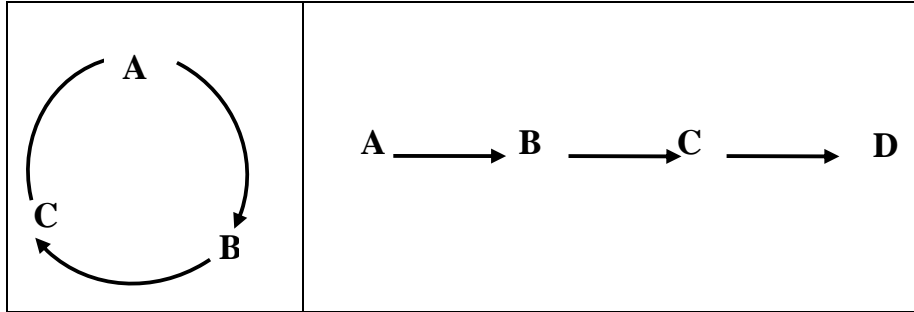
Figure (3-2): Difference between circular feedback and linear cause and effect. Source: (Researcher)

In this essence, every influence is both cause and effect and the key to seeing reality systematically is to see circles of influence (dynamic thinking) rather than straight lines (linear thinking) (Michael Goodman and Richard Karash 1995; Anderson and Lauren Johnson 1997). Systems thinking contains special terminology that describes system behavior, a summary of the most important terminology is shown in Table (3-8) (Pegasus Communications Inc. 2000a).

	A causal link between two variables where a change in X causes a change in Y in the same direction, or where X adds to Y
	A causal link between two variables where a change in X causes a change in Y in the opposite direction, or where X subtracts from Y
	"R" a reinforcing feedback loop that amplifies change. It generates exponential growth or collapse.
	"B" a balancing feedback loop that seeks equilibrium. It controls change and helps a system maintain stability

Table (3-8): The language of links and loops in Systems Thinking

The field of systems thinking has generated a broad array of tools that enable depicting the understanding of a particular system's structure and behavior graphically and designing high-leverage interventions for problematic system behavior. These tools include causal loop diagrams, behavior over time graphs, stock and flow diagrams, and systems archetypes (Michael Goodman and Richard Karash 1995).

3.4 Conclusion

Based on the analysis findings of a number of projects which attempted to develop sets of SIs, it can be concluded that the issue of SIs is very *subjective*. There is no approach or framework that is ultimate and definitive, each of them has its own advantages and disadvantages. Frameworks are seen by many as the key to organize the indicators in a meaningful way by means of a conceptual structure, so indicators emerge more naturally, and can be adjusted to the needs of a given locale or decision-makers. However, the restriction of fitting the indicators below the listed categories limited the success of frameworks and precludes its function as a meaningful tool to organize indicators. Moreover, relating the indicators back to sustainability goals became very difficult with the tendency towards fragmentation and compartmentalization. A common gap in the majority of frameworks is their *failure to capture the linkages* between the main issues of concern.

In terms of to what extent the study sample projects fulfilled the guidelines of the practical procedure for developing SIs identified by Bossel (2001), it can be noticed that they all fulfilled the second and third guidelines thoroughly in terms of identifying representative indicators and assessing performance based on indicator states. Some of them fulfilled the fourth guideline, which calls for developing a participative process such as Seattle and Minneapolis, while the others fail to do so. With regard to the first guideline, which calls for obtaining a conceptual understanding of the total system, none of them was able to fulfill it. They neglected the complexity of the interrelationship between the various system components. Obviously, there were always *gaps in modeling the issues*. Much evidence assumed that, for the kind of sustainability issues relevant to urban development, environmental

problems are typically caused by economic activity and economic activity is typically caused by social needs and demands (Ravetz 2000).

Therefore, there was a need to fill this gap by integrating a kind of systems mapping, as a means to depict the complex system, with its social, economic, environmental and institutional components. Referring to *the 'Systems Thinking'* approach and its tools proved to be valid to fill this gap.

It emphasizes the need for integration and examining system components together rather than in isolation, which definitely fits within the notion of sustainability. Its language emphasizes *circular feedback* rather than *linear cause and effect*. In this essence, every influence is both cause and effect and the key to seeing reality systematically is to see circles of influence rather than straight lines.

Based on the concept of 'Systems Thinking', this research aims to establish a model, which envisages the current processes for a typical rural Egyptian village and develop a set of indicators, which allow the interactions between factors in such villages to be tracked and the impact of policy interventions to be assessed.

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Section (2): Rural Egypt

Chapter (4): Current Conditions and Constraints

Introduction

Throughout the revolving epochs and ages, rural areas in Egypt have received less than their fair share of national attention and resources, especially when compared with urban areas. The result was the existence of a dual situation, consisting of backward rural villages and advanced urban centers, separated by a developmental gap at the local and national level alike. The 1952 Revolution has clearly been the formative event in villagers' lives which pursued the occurring of major changes in the rural environment. After the revolution a number of laws and legislation have been issued, which contributed in improving the living conditions of villagers and offered them many more rights than before. The most important of these are the Agrarian Reform Law 9 September 1952 and the Local Administration Law 1960.

This chapter aims at providing a comprehensive vision about the characteristics of a village within the context of rural Egypt. It addresses the rural-urban gap and disparity as an initial entrée to explore current condition and constraints in rural Egypt. It describes changes which have happened in rural communities since the revolution of 1952 and afterwards, within the limitations of data availability; official censuses of 1960, 1976, 1986 and 1996. The exploration of these changes encompasses the main components of the rural environment; natural, socio-economic, built environment as well as the organizing institutional framework.

4.1 The Natural Environment

Exploring changes in the natural environment encompasses the analysis of the following elements:
- Agricultural land
- Water resources
- Air quality

4.1.1 Agricultural Land

Severe encroachment on agricultural land, in terms of building haphazard residential dwellings, has been rising at a staggering pace, eating up a full million feddans (one sixth of Egypt's fertile valley) in the last two decades. Moreover, it is estimated that between 1980 and 2025 nearly half of Egypt's agricultural land will be lost to informal settlements in the absence of the ability to enforce present laws governing housing development (United Nations Development Programme and the Institute of National Planning 2004, p15). Agricultural land is analyzed in terms of the changes in two aspects:

1. The cultivated area and cropping land area
2. The land holding ownership and their patterns.

1. As can be shown in Table (4-1), although the figures indicate continual increase in both the cultivated and the cropping land area, the average share per person is continuously decreasing for both of them (Shoura Council 1996, p22). Two main aspects need to be considered to interpret these results. The first one is that the continuous increase in population exceeds the increase in both those of the cultivated and cropping land areas; as a consequence the average share per person is continuously decreased for both of them.

Year	The Cultivated Area (Million)	Cropping[5] Land Area (Million)	Population (Million)	Average share per person	
				The Cultivated Area	Cropping Land Area
1960	5.65	10.38	26.10	0.22	0.40
1970	5.80	10.90	33.10	0.18	0.33
1976	5.87	11.29	36.60	0.16	0.31
1986	6.06	11.35	48.20	0.13	0.24
1996	7.59	13.71	59.30	0.13	0.23
2002	8.15	14.35	68.80	0.12	0.21

Table (4-1): The evolution of the average share per person for both cultivated and cropping land area. Source: (CAPMAS Several editions)

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[5] The cropping land area refers to the yield of the absolute area multiplied by number of crops per year that are attainable, which is a measure of cropping density ;
The cropping land area = cultivated area × average number of crops per year

The second one is that the continual increase in the cultivated land area takes place only in the new reclamation lands due to the agricultural expansions' projects, while on the contrary in the old areas within the Valley and Delta, the continuous land loss has resulted in reducing both the cultivated and the cropped land area.

2. The patterns of landholding ownership as shown in Table (4-2) reflect the phenomenon of tiny landholdings, which is considered an obstacle for applying the adequate agricultural cycle. Consequently, the land productivity and the economic revenue decreased, which hinders the opportunity for the majority of villagers to get proper income (Institute of National Planning 1996, p43).

As can be noticed in Table (4-2), the influence of the agrarian reform laws on the patterns of land ownership primarily appears in the transformation from concentrating large holdings within the hands of a few owners to redistributing smaller land holdings to a large number of villagers. From villagers' point of view, this was definitely a big gain for them but from an economic point of view, this increases the number of tiny landholdings, which is considered unprofitable for land productivity.

Ownership Category (feddan)	Before the agrarian reform laws, 1952		After the agrarian reform laws, 1952		Year 2000 (CAPMAS 2002)	
	Owners %	Area %	Owners %	Area %	Owners %	Area %
< 5	94.3	35.4	94.1	52.1	89.9	55.5
5-10	2.8	8.8	2.6	8.5	4.3	10.4
10 -20	1.7	10.7	2.1	10.6	2.8	9.8
20 - 50	0.8	10.9	0.8	13.5	1.4	9.3
> 50	0.4	34.2	0.4	15.2	1.6	15

Table (4-2): the evolution of land holding ownership

4.1.2 Water Resources

Egypt is an arid country, which depends almost entirely on the Nile River for its water supply. Water resources in Egypt can roughly be divided into two systems (Mediterranean Environmental Technical Assistance Program 2001, p2):

- The Nile system consisting of the Nile River, its branches, irrigation canals, agricultural drains, and the valley and Delta aquifers: due to the many interconnections this is considered one system.
- The groundwater system outside the Nile valley: although considerable amounts of water are stored in this system, it is considered a non-renewable resource.

It is estimated that the Nile provides 95% of the country's fresh renewable water supply. Agriculture is almost totally dependent on this source. It is estimated that 85% of the water released from the High Aswan Dam is used for irrigation with the remaining 15% for other purposes, i.e., industry, domestic water supply, navigation, hydropower, fisheries, recreation and tourism (L. Tollefson 2005). Two important aspects that explored under the water resources element are:
1. Sources of Water Pollution
2. Water Quality Status

1. Despite the importance of water, the Nile water distribution network is subject to contamination by waste. Open waterways, especially agricultural drains, receive the bulk of the treated and untreated domestic pollution load and act as the repository and conveyance for liquid wastes. The main sources of pollution in rural areas can be identified as follows (Mediterranean Environmental Technical Assistance Program 2001, p3):

- *Domestic discharge*: the majority of domestic wastewater in rural areas is discharged directly into waterways, often without treatment. Discharges have been increasing annually due to the lack of sewerage provided as part of the existing plan for water supply networks set-up in many villages. This aggravates the problem, leading to pollution in water resources both in surface and groundwater, and increasing public health hazards, principally the risk of transmission of waterborne diseases. The constituents of domestic input to water resources are pathogens, nutrients, suspended solids, salts, and oxygen-demanding material.
- *Agricultural discharge*: Apart from being the largest consumer of water, agriculture is also a major water polluter. Saline irrigation return-flows or drainage containing agrochemical residues are serious contaminants for

downstream water users. Moreover, agricultural nitrates contaminate groundwater.

- *Industrial discharge*: although the majority of the industries discharging their wastewater into the Nile comply with the standards set by the government, there are still a significant number of industries that discharge inadequately treated wastewater into the water system, mainly into irrigation canals and agricultural drains. This means a large number of organic and inorganic substances disturb water quality.

2. The quality of Nile River and most irrigation canal water is still relatively good. This can be concluded from the monitoring results of the Nile Research Institute showing recent Biological Oxygen Demand (BOD) concentrations of 5-10 mg/l and oxygen concentrations close to saturation in most parts of the river (Mediterranean Environmental Technical Assistance Program 2001). The agricultural drains are generally contaminated with domestic and industrial effluents making them an environmental hazard and a health hazard, especially when the waters are mixed with irrigation water in reuse stations. High levels of organic materials and pathogens are observed.

Groundwater quality is generally good, although agricultural activities in areas with sandy soil have contaminated the groundwater with agrochemicals. Natural contamination of groundwater in some regions with iron and manganese poses problems for domestic water users. Moreover, groundwater in many rural areas is contaminated due to the lack of adequate sanitary system and the mixing of sewerage with groundwater.

4.1.3 Air quality

Air quality is affected by many sources of air pollution such as emissions resulted from burning domestic and agricultural waste (black cloud), polluted industries, using inadequate fuel in bakeries, traffic and the use of insecticides and chemicals by the aeroplanes for blight abatement (F.Hassan 2003b). There is no available data or measurement of emissions to indicate the level of air pollution. However, the lack of effective waste collection system and the unsafe disposal of solid waste are obvious problems in rural areas. This causes serious problems, not

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only at the village level but also for the surroundings rural and urban areas. Figure (4-1) presents some forms of risk and pollution in rural areas.

Fire risk due to storing agricultural waste above houses'roofs

Accumulation of solid waste in residential areas

Waste disposal in water streams

Figure (4-1): Some forms of pollution in rural areas

4.2 The Socio-Economic Environment

The socio – economic environment is the human environment, including the stock of knowledge, education, skills, culture and understanding. It identifies the different social and economic characteristics of the people: their age, their proficiency and their problems such as unemployment (Pearce 1994).

Within the context of rural Egypt, exploring changes in the socio-economic environment encompasses the analysis of the following elements:

- Population Growth
- Economic Activities
- Educational Condition
- Services Provision

The total land area of Egypt is about 1,000,000 km sq. of which only 5.5% is inhabited and cultivated areas (CIA 2006). Egypt consists of 27 governorates classified under four categories; Urban Governorates, Lower Egypt, Upper Egypt and Frontier Governorates as shown in Figure (4-2a & 4-2b). Rural inhabitants are mostly concentrated in Lower Egypt and Upper Egypt governorates.
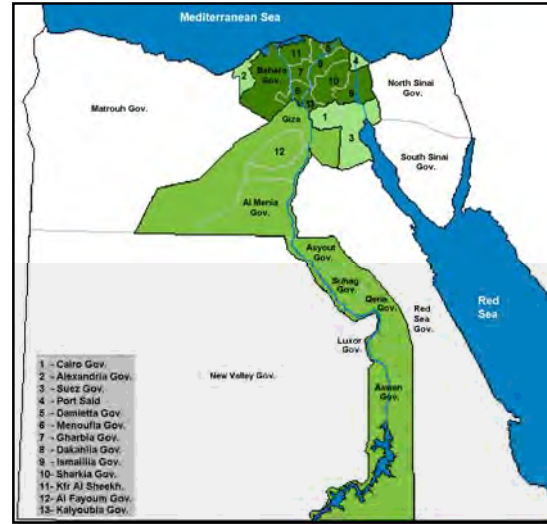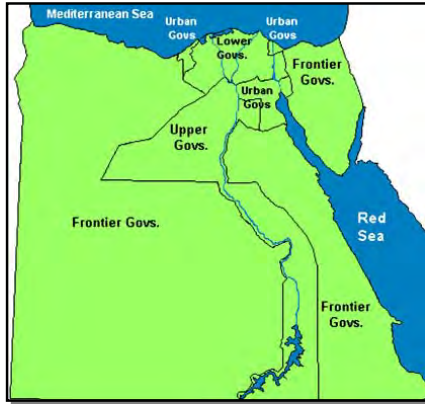
Figure (4-2a) Governorates'
classification in Egypt
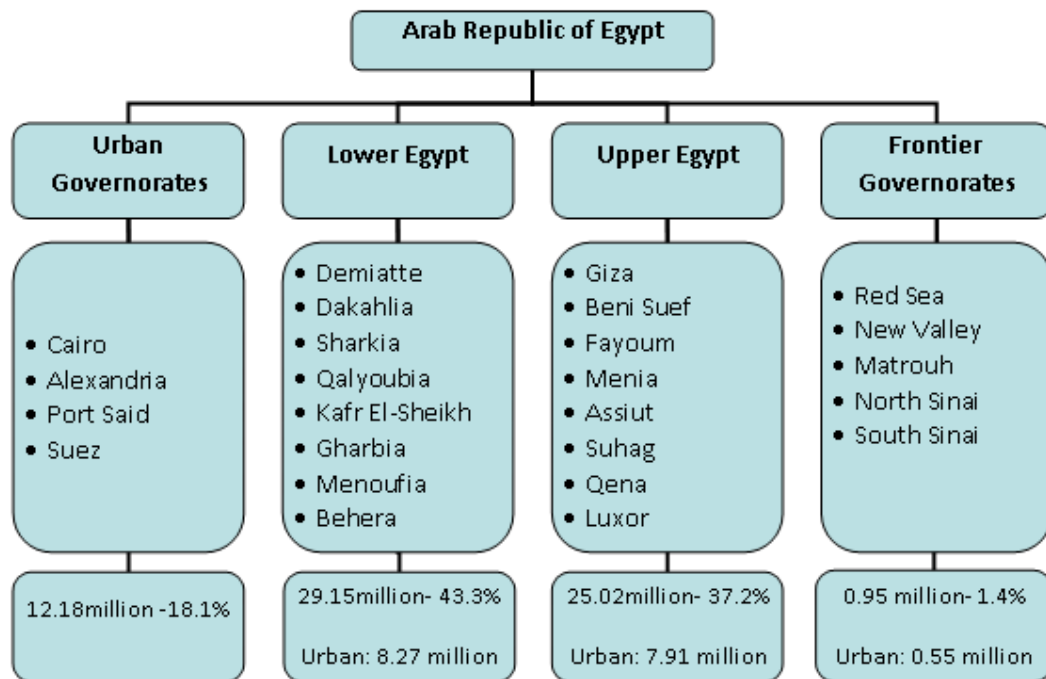
Figure (4-2b): Population distribution amongst Egypt's Governorates –
2002 statistics

Rural - urban gaps appear clearly within the socio economic environment. There are considerable regional disparities among the governorates of Egypt, which reflect the imbalance of resources distribution and the inequity between the citizens. These affect social cohesion at the national level. Evidence for this has clearly appeared in the distribution of the poor at the national level. According to 1999/2000 statistics the average percentage of the poor as a percentage of total is 16.74%; whereas urban in relative to rural is 9.21% and 22.07% respectively as shown in Figure (4-3) (United Nations Development Programme and the Institute of National Planning 2004).
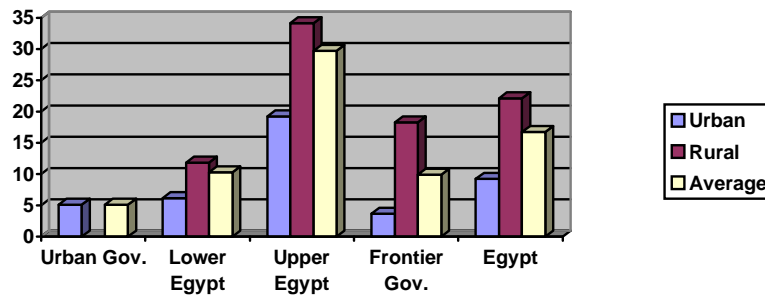
Figure (4-3): Rural- urban disparity in terms of distribution of poor people amongst the different regions

4.2.1 Population growth

Total population according to 2002 statistics is 67.6 million, where the total number of rural inhabitants is about 38.7 million, constituting 57.2% of the total population in relative to 28.9 million in urban areas constituting 42.8% of the total population of the country. The average population growth rate is 2.1% (1996-2001), where the rate in urban areas in relative to rural is 2.3% and 1.9% respectively (United Nations Development Programme and the Institute of National Planning 2004).

There is a continuous decrease in the number of rural population in relative to urban population as shown in Table (4-3). This is not due to a decrease in birth rate - given the increase in children number under 6 years in rural areas in relative to urban areas as shown in Table (4-4) - but rather for other two reasons:

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Census	Total pop. (million)	Urban		Rural	
		Number	%	Number	%
1907	11.2	1.9	17.2	9.3	82.8
1927	14.2	3.8	26.9	10.4	73.1
1937	15.9	4.5	28.2	11.4	71.8
1947	19	6.4	33.5	12.6	66.5
1960	26.1	10	38.2	16.1	61.8
1976	36.6	16	43.8	20.6	56.2
1986	48.2	21.2	44	27	56
1996	59.3	25.3	42.6	34	57.4
2002	67.6	28.9	42.8	38.7	57.2

Table (4-3): Population evolution on the national level from (1907 – 2002)
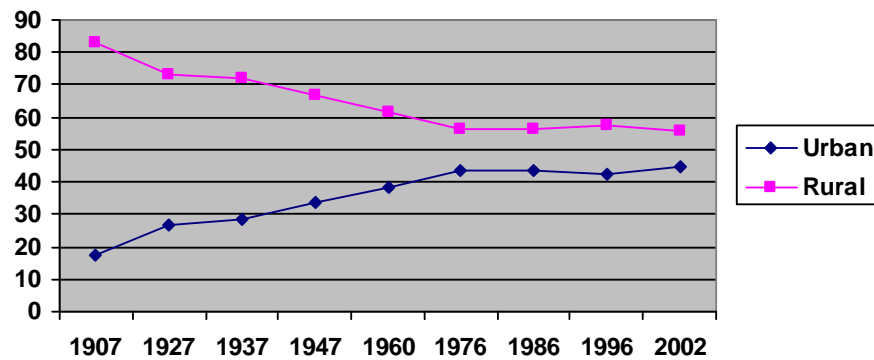
- Firstly, there is immigration from rural to urban areas by people looking for a job opportunity or better standards of living.
- Secondly, there has been a transformation in the classification from village to city, due to village exceeding the threshold defined for village's population - (50,000 people), which is called "the administrative urbanization" phenomenon. This leads to the appearance of new types of settlements described as "semi urban or semi rural", which encompasses both urban and rural characteristics (Mohamed 1998, p24).

Census	Urban			Rural		
	Total pop. (000)	Children No. < 6 years (000)	%	Total pop. (000)	Children No. < 6 years (000)	%
1976	16.04	2.46	**15.3**	20.59	3.86	**18.7**
1986	21.20	2.75	**13.1**	27.00	4.37	**16.2**
1996	25.29	2.5	**9.9**	34.02	4.36	**12.8**

Table (4-4): A comparison between the population growth rate (<6 years) in urban & rural areas, (CAPMAS 1976; CAPMAS 1986; CAPMAS 1996)

4.2.2 Economic activities

There is a noticeable decrease in the percentage of the population working in agriculture in relation to the percentage working in office jobs, service sector and trade over the various censuses as shown in Table (4-5). This change reflects the alteration of the rural community to an urban community settled on agricultural land.

In terms of *women participation in the labor force*, it can be noticed that although there is considerable increase in women contribution in the labor market in rural areas, there is still a gap between the percentage of male relative to female as well as amongst rural females in relative to urban females over the various censuses as shown in Table (4-5). Obviously, the higher figures of engagement in the labor force are for urban females, while the lower ones are for rural females.

4.2.3 Educational conditions

The evolution of population educational status segregated into male and female and rural relative to urban is indicated in Table (4-6). Two main aspects can be recognized as follows:

1. There has been a considerable improvement in the **illiteracy rate** in general over the various censuses. However, in comparison with the illiteracy rate for urban population, there is still a wide gap between urban and rural. Likewise, there is a gap between the percentages of illiterate rural male in relation to rural female as well as between rural and urban females. This is considered one of the major social endemic problems in rural areas. Moreover, it is one of the parameters that indicate the gender gap clearly.

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Table (4-5): The distribution of population amongst economic activities segregated by gender and (urban or rural)

Economic Activities		1960 Urban No.*	%	1960 Rural No.	%	1976 Urban No.	%	1976 Rural No.	%	1986 Urban No.	%	1986 Rural No.	%	1996 Urban No.	%	1996 Rural No.	%
Technicians and scientific professionals	Male	129.0	5.0	41.9	1.0	408.6	9.2	135.6	2.6	760.1	12.1	330.0	5.0	1559.2	19.6	1010.0	10.9
	Female	45.3	1.7	4.4	0.1	163.8	3.7	17.7	0.3	358.2	5.7	72.0	1.1	795.0	10.0	282.9	3.0
	Total	174.3	6.7	46.3	1.1	572.4	12.8	153.3	3.0	1118.3	17.8	401.9	6.1	2354.2	29.6	1192.9	13.9
Administrative, business managers and business owners	Male	66.6	2.6	7.8	0.2	81.9	1.8	15.2	0.3	74.8	1.2	10.5	0.2	483.3	6.1	162.3	1.7
	Female	3.6	0.1	0.2	0.0	11.6	0.3	0.5	0.0	12.0	0.2	3.2	0.0	72.7	0.9	15.9	0.2
	Total	70.3	2.7	8.0	0.2	95.5	2.1	15.7	0.3	86.8	1.4	13.7	0.2	561.0	7.1	178.2	1.9
Office workers	Male	203.8	7.8	41.6	1.0	433.6	9.7	134.7	2.6	436.9	6.9	229.7	3.5	359.8	4.5	328.2	3.5
	Female	12.7	0.5	0.2	0.0	126.3	2.8	9.3	0.2	288.2	4.6	57.6	0.9	272.5	3.4	164.6	1.8
	Total	216.5	8.3	41.7	1.0	559.9	12.6	144.0	2.8	725.1	11.5	287.3	4.3	632.4	7.9	492.9	5.3
Sale & Services workers	Male	680.7	26.2	405.7	9.3	884.3	19.9	467.1	9.0	847.8	13.5	511.0	7.7	699.3	8.8	639.1	6.9
	Female	94.5	3.6	34.1	0.8	75.4	1.7	21.5	0.4	72.5	1.2	15.3	0.2	92.6	1.2	30.4	0.3
	Total	775.2	29.8	439.8	10.1	960.2	21.5	488.6	9.4	920.2	14.6	526.3	7.9	791.9	10.0	669.5	7.2
Crops farmers, Livestock farmers and hunters	Male	300.4	11.6	3252.7	74.9	378.9	8.5	3575.2	68.9	595.7	9.5	3669.5	55.4	486.2	6.1	3986.5	43.0
	Female	7.4	0.3	121.9	2.8	5.8	0.1	75.1	1.4	9.9	0.2	55.7	0.8	13.9	0.2	195.5	2.1
	Total	307.8	11.9	3374.6	77.7	384.7	8.6	3650.4	70.4	605.5	9.6	3725.2	56.3	500.1	6.3	4182.0	45.1
Production, operation, transportation and carriers workers	Male	929.3	35.8	366.8	8.4	1476.9	33.1	522.0	10.1	1851.4	29.4	896.9	13.5	2270.4	28.5	1499.9	16.2
	Female	21.9	0.8	18.6	0.4	44.7	1.0	13.5	0.3	56.6	0.9	12.5	0.2	80.5	1.0	46.9	0.5
	Total	951.2	36.6	385.3	8.9	1521.5	34.1	535.5	10.3	1908.0	30.3	909.4	13.7	2350.9	29.6	1546.8	16.7
Individuals who cannot be classified according to profession	Male	80.2	3.1	37.8	0.9	257.2	5.8	169.1	3.3	658.3	10.5	612.7	9.3	495.1	6.2	614.6	6.6
	Female	21.7	0.8	10.0	0.2	108.0	2.4	28.9	0.6	275.2	4.4	145.0	2.2	269.1	3.4	299.1	3.2
	Total	101.9	3.9	47.8	1.1	365.2	8.2	197.9	3.8	933.5	14.8	757.7	11.4	764.2	9.6	913.7	9.8
Total	Male	2390.1	92.0	4134.2	95.6	3921.9	88.0	5018.9	96.8	5224.9	83.0	6260.2	94.5	6355.3	79.9	8240.7	88.8
	Female	207.0	8.0	189.3	4.4	533.5	12.0	166.5	3.2	1072.6	17.0	361.2	5.5	1596.4	20.1	1035.4	11.2
	Total	2597.1	100	4343.6	100	4457.4	100	5185.4	100	6297.5	100	6621.4	100	7954.7	100	9276.0	100

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Educational condition		1960 Urban No.	%	1960 Rural No.	%	1976 Urban No.	%	1976 Rural No.	%	1986 Urban No.	%	1986 Rural No.	%	1996 Urban No.	%	1996 Rural No.	%
Illiterate	Male	1337.03	19.44	3721.46	33.15	1653.03	13.56	4078.81	27.72	2120.69	14.35	4485.13	23.89	2024.24	10.15	4616.04	18.54
	Female	2262.87	33.14	5276.16	47.00	3105.69	25.48	6272.16	42.63	2451.78	16.59	7090.00	37.76	3284.72	16.47	7721.03	31.02
	Total	3589.89	52.58	8997.61	80.16	4758.72	39.04	10350.97	70.35	4572.47	30.95	11575.13	61.65	5308.96	26.63	12337.07	49.56
Read & write	Male	1402.21	20.54	1525.98	13.59	1893.78	15.54	1945.71	13.22	1955.18	13.23	2269.89	12.09	2229.66	11.33	2929.78	11.77
	Female	761.37	11.15	364.58	3.25	1133.13	9.30	563.05	3.83	1465.56	9.92	1049.83	5.59	1692.08	8.49	1517.14	6.09
	Total	2163.58	31.69	1890.56	16.84	3026.90	24.83	2508.76	17.05	3420.73	23.15	3319.71	17.68	3952.34	19.82	4446.92	17.86
Primary	Male	0.00	0.00	0.00	0.00	831.14	6.82	566.94	3.85	746.96	5.06	748.01	3.98	1034.11	5.19	1291.57	5.19
	Female	0.00	0.00	0.00	0.00	565.50	4.64	167.15	1.14	638.91	4.32	392.01	2.09	914.13	4.58	915.42	3.68
	Total	0.00	0.00	0.00	0.00	1396.64	11.46	734.09	4.99	1385.88	9.38	1140.02	6.07	1948.24	9.77	2206.98	8.87
< average, average and > average qualification	Male	588.58	8.59	231.03	2.06	1410.30	11.57	637.25	4.33	2598.62	17.59	1851.51	9.86	3645.34	18.28	3397.01	13.65
	Female	283.95	4.16	25.45	0.23	885.33	7.26	123.08	0.84	1852.41	12.54	629.52	3.35	3093.91	15.52	1932.84	7.76
	Total	870.53	12.75	256.47	2.28	2295.63	18.83	760.33	5.17	4451.03	30.13	2481.03	13.21	6739.25	33.80	5329.84	21.41
University degree	Male	102.86	1.51	11.52	0.10	364.20	2.99	62.41	0.42	643.14	4.35	167.79	0.89	1208.52	6.06	433.21	1.74
	Female	15.28	0.22	0.45	0.00	120.19	0.99	5.16	0.04	205.24	1.39	18.45	0.10	711.00	3.57	117.30	0.47
	Total	118.13	1.73	11.96	0.11	484.39	3.97	67.57	0.46	848.38	5.74	186.24	0.99	1919.51	9.63	550.52	2.21
Diploma, Master and doctoral degree	Male	12.27	0.18	2.13	0.02	18.93	0.16	0.87	0.01	21.73	0.15	1.49	0.01	43.59	0.22	9.68	0.04
	Female	0.97	0.01	0.03	0.00	3.30	0.03	0.08	0.00	6.11	0.04	0.17	0.00	20.86	0.10	3.84	0.02
	Total	13.24	0.19	2.16	0.02	22.23	0.18	0.96	0.01	27.84	0.19	1.66	0.01	64.45	0.32	13.53	0.05
Unclear	Male	33.65	0.49	27.75	0.25	92.47	0.76	121.75	0.83	36.96	0.25	38.03	0.20	2.91	0.01	4.85	0.04
	Female	38.97	0.57	38.28	0.34	112.86	0.93	168.45	1.14	31.21	0.21	35.02	0.19	2.12	0.01	3.95	0.02
	Total	72.62	1.06	66.03	0.59	205.33	1.68	290.20	1.97	68.17	0.46	73.05	0.39	5.03	0.03	8.79	0.04
Total	Male	3464.6	50.7	5519.9	49.2	6363.8	51.4	7413.7	50.4	8123.3	55.0	9561.9	50.9	10218.4	51.3	12682.1	50.9
	Female	3363.4	49.3	5704.9	50.8	5926.0	48.6	7299.1	49.6	6651.2	45.0	9215.0	49.1	9719.4	48.7	12211.5	49.1
	Total	6828.0	100.0	11224.8	100.0	12189.8	100.0	14712.9	100.0	14774.5	100.0	18776.9	100.0	19937.8	100.0	24893.6	100.0

Table (4-6): The distribution of population in terms of their educational condition (>10 years) segregated by gender and (urban or rural)

2. There has been a considerable improvement in *the level of educational attainment* over the various censuses. The rural-urban gap mainly appears with the high degrees. A gender gap can be recognized at all levels of educational attainments in rural areas. The gap as well appears amongst rural females in relation to urban females.

4.2.4 Services Provision

The focus in service provision is on main services; education, health and infrastructure. The status of service provision can be summarized as follows:

1- *Education*: there is a noticeable improvement in the provision of educational services in terms of number of schools and variety in types (Azhar and governmental) over the different educational stages; primary, preparatory, secondary, and technical secondary. However, there are some constraints, which hinder improving the educational level in rural areas. This is mainly caused by the limited financial budget for education, which resulted in the poor conditions of educational services as follows:

▪ Classroom density rises to more than 40 students per class for primary and preparatory stages in most of the governorates (United Nations Development Programme and the Institute of National Planning 2003, p28).

▪ The majority of schools in rural areas work for two and sometimes for three sessions to solve the problem of insufficient places for pupils in learning age.

▪ A high percentage of unfit school buildings, according to 2000/2001 statistics, it reached 23.8% at the national level (United Nations Development Programme and the Institute of National Planning 2003, p144).

There is no segregated data into rural-urban categories; however, the majority is obviously in rural areas.

2- *Health*: there has been a considerable improvement of the supply of healthcare services in rural areas, evidence for this is provided by the rise of the average life expectancy at birth from 55 to 67.1 years between 1976 & 2001 and the increase in medical unites

from 67 units in 1952 to 2588 in 2000 (CAPMAS 2002). However, in terms of satisfaction of needs of healthcare units, the number of healthcare units is not sufficient to fulfill the needs of the increased number in population. Furthermore, most of these units lack the proper equipment and efficient staff performance. A wide gap exists between healthcare services in urban and rural areas. Table (4-7) includes a rural-urban comparison of some indicators, which reflect the conditions of healthcare services in both of them (UNDP, ORDEV et al.2003, p25).

Indicators	Urban (%)	Rural (%)
Prevalence of birth control means	61	52
The rate of mothers receiving prenatal healthcare	61	38.5
The rate of mothers delivering under medical supervision	69.8	34.6
The rate of children immunized by the vaccines specified by the Ministry of Health	92.8	91.8
The rate of children <5 years with less than normal weight	3	4.7

Table (4-7): Rural –urban disparities in healthcare services

It can be noticed that some indicators reflect a wide gap between the urban and rural level of service. For example, the differences in the rates of mothers receiving prenatal healthcare and delivering under medical supervision between urban and rural areas are high, unlike the rate of children immunized by the vaccines specified by the Ministry of Health. The wide gap of the former has an implication of the effect of the lack of healthcare for pregnant women and their fetuses in rural areas, while the later reflects the successful efforts of the national vaccination campaigns, a practice not followed in other health matters.

3- **Infrastructure**: having adequate living amenities including safe drinking water, adequate sanitary drainage systems and contemporary forms of energy is a basic requirement of a family dwelling. Similar to the other services, there has been continuous improvement of infrastructure supply in rural areas compared to the previous status of rural areas, whereas the situation is

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dissimilar in comparison to urban areas. Table (4-8) indicates the rural–urban gap in terms of infrastructure supply according to 2000 statistics (UNDP, ORDEV et al.2003, pp 23,24).

Infrastructure		Rural (%)	Urban (%)
Safe drinking water	Network	75.9	99
	Others	24.1	1
Sanitary sewage disposal	Network	5.7	37.5
	Others	94.3	62.5
Electrical services	Network	95.9	99.9
	Others	4.1	0.1

Table (4-8): Rural–urban disparities in the supply of infrastructure

It can be recognized that almost all Egyptian villages are connected to the electricity grid, the majority have access to safe drinking water (although there is no information about the water quality), while 94.3 % of Egyptian villages do not have adequate sanitary sewage systems.

4.3 The Built Environment

The built environment also refers to man made environment is everything man made or add or create in this world that wasn't a part of natural environment like (roads – buildings - etc.) (Glasson, Therivel et al. 1994). Exploring changes in the built environment is based on compiling a study sample, which contains 43 villages from 4 governorates of Lower Egypt, 6 markazes, as shown in Table (4-9) & Figure (4-4). Details of the villages including their names, forms, areas, etc. are illustrated in Appendix (B).

The sample is chosen from a total of 76 villages. This number represents the villages, which have been surveyed by Ain Shams University team during the period from April 2002 to May 2005 as part of a pilot project sponsored by the General Organization of Physical Planning (GOPP) - Ministry of Housing, Utilities and Urban Communities (MHUUC). The pilot project aimed to prepare the Instructional Physical Plans for all Egyptian Villages. It has been taken into consideration while selecting the study sample that they include villages which are diverse in form, area, location, population, etc. to be representative of villages in Lower Egypt.

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Governorate	Markaz	No. of Villages	Names of Villages
Qalyobia	Qalyob	6	• Tanan • Sendion • Sanafeir • Balaqs • Meit Halfa • Nay
	Shebein El Qanater	8	• ElGaafra • Tahanop • ElAhraz • Tohorya • Monshaat Elkeram • Kafr Shebein • Nawa • ElMoreig
Sharqia	Belbeis	8	• ElAdlya • ElBalashon • Shobra Elnakhla • Awlad Seif • Elzawamel • Gheeta • Anshas Elraml • Kafr Ayob Soliman
Gharbia	El Mahala El Qobra	10	• Saft Trab • Shobra Babel • ElHayatem • Mahalet Abo Ali Elqantara • ElAmerya • Mahalet Hassan • ElMoatamedya • Beshbeish • Damro ElSadat • ElShaheidy
	Basion	4	• Sa ElHagar • Kafr ElMonshea Abo Homor • Kotama ElGhaba • Qransho
Daqahlya	Sherbein	7	• Kafr Elwekala • Kafr ElAtrash • Kafr Elhag Sherbeini • Raas Elkhaleig • Kafr Elteraa Elqadeim • Elhesas • Bosat Kareim Eldein
Total		**43**	

Table (4-9): Study sample components

Lower Egypt Governorates

Governorates of Qalyobia, Sharqia, Daqahlya and Gharbia

Governorate: Qalyobia
Markaz: Shebein El Qanater &
Qalyob

Governorate: Sharqia
Markaz: Belbeis

Figure (4-4): Contents of the study sample

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Exploring changes in the built environment encompasses the analysis of 3 main aspects as follows:

- Physical characteristics
- Urban Fabric
- Housing Patterns

4.3.1 Physical characteristics

The distinction of the physical characteristics between the old and current village can be obviously recognized with regard to the following elements:

1. Urban sprawl is increasing in the form of expansion on to agricultural land. This takes multiple forms and follows various growth patterns. Following the changes of the physical form of the study sample villages through 1945, 1985, and 2002[6] respectively, reflects certain types of physical forms and growth patterns. The growth particularly exceeds the old boundaries along the roadways. Neither physical nor natural barriers are considered as obstacles for to the urban sprawl.

2. Differences in roads network patterns can be clearly distinguished between the old and the current village. Roads inside the old area distinguished by their narrowness (2-3m), irregularity, and their closed ends. Dissimilarly, roads in the expanding areas are distinguished by their straightness, regularity and continuity.

3. Patterns of services distribution within the village have evolved. In the old status, services were either concentrated in the centre of the old village or distributed around the ring road bordering the urban agglomeration (Daier El-Nahya), while currently , with the increasing number of services as well as the expansion of villages, service distribution takes various forms.

Figure (4-5) summarizes the physical characteristics of the Egyptian village at the current status, as deduced from the analysis of the study sample.

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[6] The source of the physical demarcation of 1945 and 1985 is from governmental documents, while the 2002 demarcation is based on the urban survey of the project. The old village is represented by the boundary of 1945, while the current one is represented by the boundary of 2002.
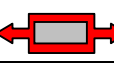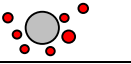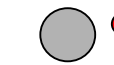
Characteristics	Patterns			
Physical form	*Compact*	*Longitudinal*	*Scattered*	*Unidentified*
Urban Growth	*Concentric*	*Longitudinal*	*Scattered*	*Radial*
Road network	*Ramified*	*Regular*	*Net*	*Radial*
Services distribution	*Concentric inside or outside the physical demarcation 1985*		*Along main axis*	*Scattered*

Figure (4-5): Summary of the physical characteristics of the Egyptian villages. (Source: Researcher)

4.3.2 Urban Fabric

The distinction in the urban fabric between the old and the expansion area can be clearly recognized. The urban fabric inside the old village is called the *traditional or the compact*. It characterizes by the narrow roads (average 1.8 – 3.2 m), with closed-ends and the irregular plots size. The urban fabric in the expansion areas can be classified into 3 main patterns as follows:

1. The *linear blocks*: in this pattern, construction follows the agricultural troughs borders and roads are regular but still narrow. This pattern appeared in the mid seventies in the expansion areas outside (Daier El-Nahya).
2. The *uncompleted blocks*: this pattern appeared at the mid of the nineties, where the blocks lay along the paved roads that lead to the nearby settlements or towards the canals and agricultural drains.
3. The *dotted scattered*: this pattern appeared at the fringes of expansion areas, where lands are not yet built or sold. It represents the expansion at the beginning of the eighties as well as the random establishment during the current status.

Figure (4-6) presents an example, which includes the four urban fabric patterns illustrated above.

kotama Elghaba- Markaz Basion- Gharbya Governorate			
The traditional pattern	The linear blocks pattern	The uncompleted blocks pattern	The dotted scattered pattern
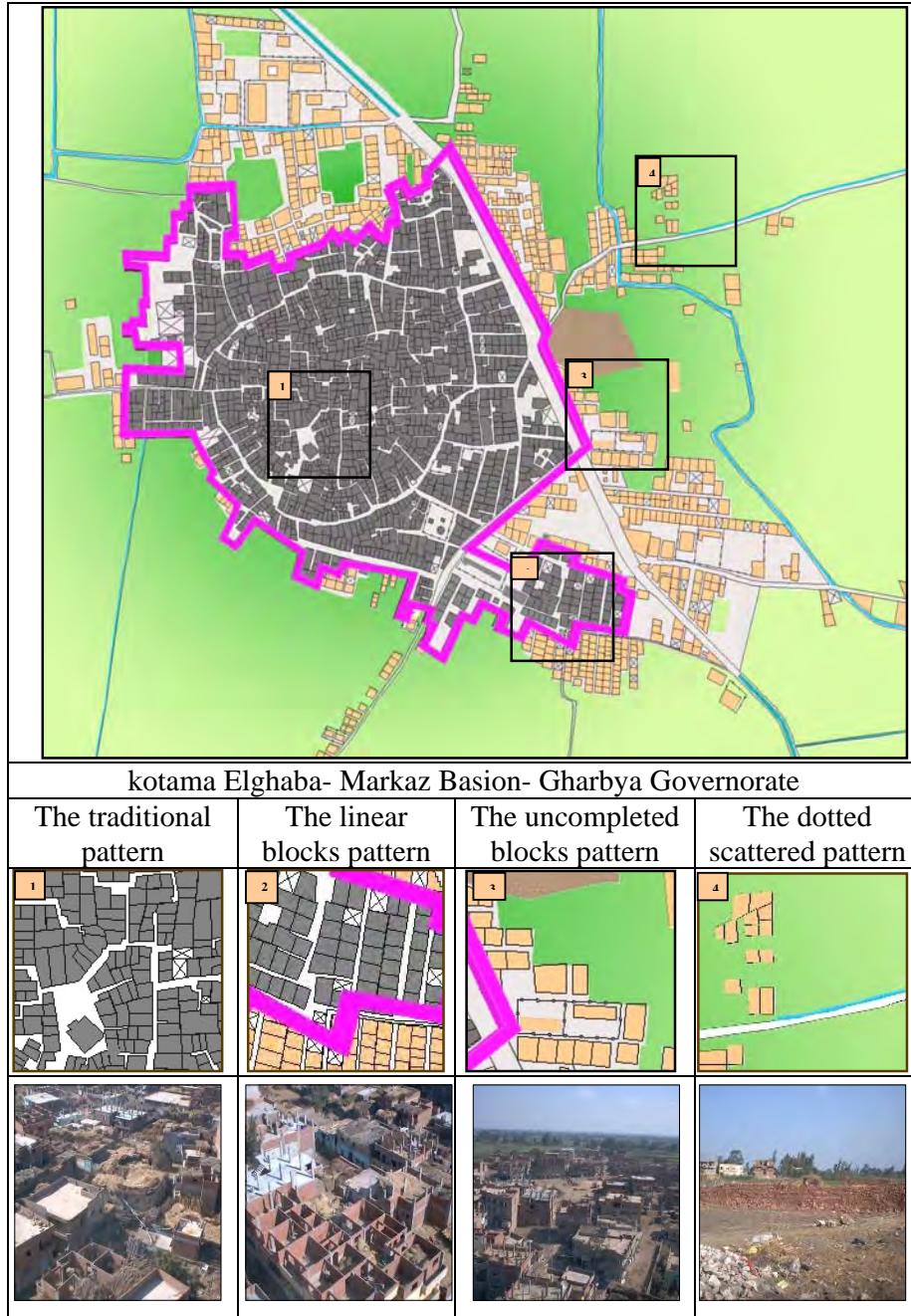
Figure (4-6): An example of urban fabric patterns in rural Egypt

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4.3.3 Housing patterns

New patterns of housing have been emerged to adapt the recent needs due to changes in the social and economic status of the dwellers. Buildings heights are between 3 and 5 stories. Construction types transformed from bearing walls and mud brick to concrete skeletons with red or cement bricks. Table (4-10) contains a description of the different housing patterns in terms of their variance in spatial components, heights, construction type and building materials and place of existing. The tendency towards the urbanization characteristics can be clearly recognized.

Housing pattern	Spatial components	Heights	Construction types & building materials	Place of existing	Plan
Traditional rural	It contains 3 main parts: one for housing, another for cattle (stable) and the other is for storing. Basically for farmers' needs	Ground or one story	Mud brick	The old nucleus at the heart of the village	
Urban	Residential buildings include a number of flats for housing, no places for cattle. Basically for dwellers not working in agriculture	3-5 stories	Concrete skeletons using red or cement brick	The extension areas and inside the nucleus when the original building is demolished and re-established	
Semi – urban or Semi -rural	Mainly designed for housing and sometimes includes a place for cattle in the ground floor with separate entrance. Mostly occupied by workers	2-3 stories	Bearing wall using red or cement brick	Areas around the boundary of the old village (Daier El-Nahya)	
Spontaneous	It includes small area for housing and a space for cattle outside, could be shaded. Mostly occupied by farmers	Ground floor	Light constructions using fronds, mud or brick covered by mud layer	Scattered on the agricultural lands and at the fringes of the village.	

Table (4-10): Description of housing patterns in rural Egypt

4.4 Institutional Framework

In 1960, a first law concerning the local administration is issued, law No. 124. Since this date, Egypt is divided into administrative units and a villager council is established to represent the village. The council was responsible on providing the main services to the village and its satellites. They reached 1100 but they could not continue due to the lack of financial resources and the limited technical capabilities (Scientific Research Academy 1980, pp19-20). At the1973, a republic declaration is issued for establishing an organization to execute general policies and programs for re-establishing the Egyptian Village within 20 years. As a result the Organization of Reconstruction and Development of the Egyptian Village (ORDEV) is established on the central level. Following this a number of local units belonging to the ORDEV are established in all of the governorates to coordinate between the different efforts and monitor the execution processes. Currently, the active law concerning the local administration is law 43 for year 1979. Each village has a local administration, which is considered the official governmental representative. The organizing institutional framework of the local administration, with its sectors and administrations is indicated in Figure (4-7).
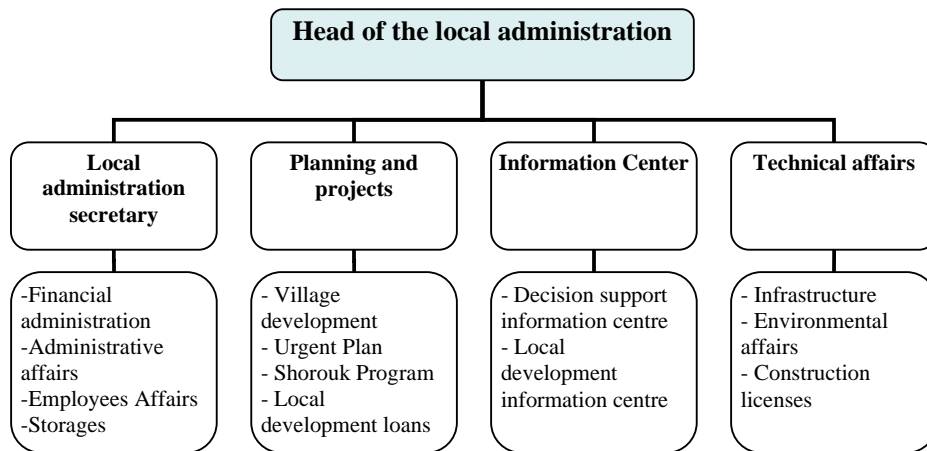
Figure (4-7): The organizing institutional framework

Source: (GOPP 2005b)

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The administrative levels of the local rural and urban communities in Egypt according to their administrative divisions as of August 2002 are as shown in Table (4-11).

Type of community	Number
Hamlets (Ezbah, Kafr and Nag)	26764
Satellite villages	4552
Main or mother villages	1133
Small towns	33
Capital cities (administrative centres)	179
Districts (hai) in cities	71
Governorates	27

Table (4-11): The distribution of administrative units (2002). Source: (UNDP, ORDEV et al.2003)

4.4.1 Financial Resources

There are five main sources of fund for each village, primarily for service provision and promoting development. They can be summarized as follows:

1. Central Government
2. Local revenues
3. Shorouk Program (a broad explanation of the program will be illustrated in chapter 5)
4. Social Fund
5. Urgent Plan

The amount of fund with respect to the first four sources differs from village to another based on the village own circumstances in terms of size, population, development status, etc. However, the amount of fund of the "Urgent Plan" is constant for all villages. The "Urgent Plan" is an annual fund of 250,000 L.E. from the government to each village[7] since the beginning of year 2000 for ten successive years. This fund is expended through the formal organizations of the local administration in consultation with representatives from the parliament and local popular councils (UNDP, ORDEV et al.2003, pp 30,42).

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[7] The village level here concerns the level of satellite villages.

4.4.2 Institutional Constraints

Due to the heavily centralized system in Egypt, almost all responsibilities are concentrated in the central government, while local government has no authority to manage their own affairs, such as service delivery and urban management. Evidence, can be found in the Egypt Human Development Report (EHDR) of 2004:

"The central government combines the roles of planning, budgeting, financing, resource allocation, regulation, monitoring, evaluation and service delivery"

"There is a fact that local government has little, if any, authority over matters relevance to local communities"

(United Nations Development Programme and the Institute of National Planning 2004, p 1)

In fact, a close look at the current constraints in rural areas indicates that their roots are embedded in the institutional dimension in terms of rigid legislatives and bureaucracy. Some of the aspects, which reflect the current institutional constraint in the different sectors, can be summarized as follows:

- Law 145/1988 abolished the elected Popular Councils' right to interpolate; at the village level, the previously elected mayor (*Omda)* is now appointed.
- In the housing sector, while Law 3/1982 assigns to the GOPP the preparation of master-plans and assigns to local government units the preparation of detailed plans and implementation, in reality, GOPP undertakes the whole task, with the help of consultants.
- Contradiction between laws and decrees of different ministries, for example the contradiction between the governor's decision of Demiatte Governorate, which allows building on barren land and the Ministry of Agriculture law, which forbids building on any land classified as agricultural land even if it is not suitable for cultivation any more. As a sequel, owners neither can get license to build on their own lands nor can cultivate it (GOPP 2005b).
- The substantial inflexibility in reallocation of resources among the different headed categories of the national budget. Governors have lost the authority to transfer budget allocations from one budget headed category (bab) to another and even within the same one. For example,

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the governorate cannot shift funds allocated from one investment project to another, such as, from a hospital to a school because these being under the investment budgets of two different ministries.

- Similarly, in the education sector, the Ministry of Education (MOE) is considered by law to be decentralized in terms of budgets, but in reality government financing of public education is highly centralized: school fees are collected but not retained by the schools: they are directly transferred to the MOE, which also sets the salary scale for all teachers and school administrative staff.

All these constraints synthesized to hinder the development of rural areas, which result in a rural-urban gap on the national level as well as on the local level. Calls are raised to end the long lost justice and narrow the rural-urban gap, fundamentally in terms of fair distribution of resources between both of them.

4.5 Conclusion

Exploring the current conditions of rural Egypt indicates that, notwithstanding the considerable improvements in the various aspects of the rural environment, there is still a rural – urban gap on the national and local level alike. The exploration encompassed the changes of the main components of the rural environment; natural, socio-economic, built environment as well as the organizing institutional framework.

With respect to *the natural environment*, the issue of urban encroachment on agricultural land is of crucial importance. It represents a real threat for losing one of the most precious resources on the national level. The limited cultivated land accompanied by the continuous increase in population leads to a continuous decrease of the average share per person in both of the cultivated and cropping land areas. The phenomenon of tiny landholding is considered an obstacle for applying the adequate agricultural cycle. Consequently, the land productivity and the economic revenue are affected negatively. Water resources are subject to contamination by disposed wastes, principally: domestic, agricultural and industrial waste. Moreover, groundwater in many rural areas is contaminated due to the lack of adequate sanitary system and the mixing of sewerage with groundwater. Air quality is affected by polluted

emissions resulted from burning domestic and agricultural waste (black cloud), polluted industries and traffic. However, there is no available data or measurements of emissions to indicate the level of air pollution in rural areas.

In terms of *the socio – economic environment*, there is a noticeable decrease in the percentage of population profession agriculture in relative to office jobs and service sector, which reflects the alteration of the rural community to an urban community, settles on agricultural land. There is a substantial improvement in the illiteracy rate, the level of educational attainment and the level of services provision. However, in relative to the level in urban areas, a noticeable gap can be recognized. Gender gap appears clearly, especially with regard to the illiteracy rate and the level of educational attainment. The lack of adequate sanitary sewage system for the majority (94.3%) of Egyptian villages represents a vital problem in rural Egypt.

With regard to *the built environment*, the changes in the physical characteristics, the urban fabric and the housing patterns are very remarkable. The differences between the old village and the expansion areas, which extremely exceeds on the roadways can be clearly distinguished. Road network inside the old area distinguish with its narrowness, irregularity, and their closed ends, dissimilarly, roads in the expansion areas distinguish with its straightness, regularity and continuity. New patterns of housing have been emerged to adapt the recent needs as a reflection to the changes in the social and economic status of the dwellers. Buildings heights are between 3-5 stories. Construction types transformed from bearing walls and mud brick to concrete skeletons with red or cement bricks. The tendency towards urbanization can be clearly recognized in all the physical aspects of the Egyptian villages.

Concerning *the institutional framework*, each village has a local administration, which is considered the official representative of the central government in the village. However, due to the heavily centralized system in Egypt, almost all responsibilities are concentrated in the central government, while local government has no authority to manage their own affairs, such as service delivery and urban

management. Moreover, the rigid legislatives principally in terms of the substantial inflexibility in reallocation of resources and bureaucracy are considered fundamental constraints, which hinder the development process in rural Egypt.

The next chapter discusses the suggested mechanism for reform to overcome these constraints and promote the sustainable development in rural areas. Moreover, it explores the various development initiatives concerning rural areas.

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Chapter (5): Reform and Development Initiatives

Introduction

In response to the raised calls for narrowing the rural – urban gap and overcoming the development constraints in rural Egypt, participation and decentralization are seen by many as key mechanisms for reform and promoting sustainable development in Egypt in general and in rural areas in particular (United Nations Development Programme and the Institute of National Planning 2003).

This chapter provides a brief explanation of the concepts and practice of participation and decentralization in Egypt, recognizing that neither decentralization nor participation is an end in itself but rather a mechanism for reform and a means towards promoting sustainable development. It then, explores the various development initiatives concerning rural areas, with a focus on the current participatory planning approach. It investigates other successful experiences of participatory planning for sustainable rural development in developing countries; such as the "Participatory Rural Appraisal" approach in order to examine the position of the current planning approach on the participation scale.

5.1 Mechanisms for reform

It is commonly assumed that public participation is essential for sustainable development. However, forms of participation which do not translate into real influence in decision making can become a sterile exercise. Therefore, the need for decentralization is crucial: it makes participation effective as it allows civil actors to localize issues and find local solutions to local problems (United Nations Development Programme and the Institute of National Planning 2004).

Participation and decentralization are very timely issues currently in Egypt. Evidence for this is provided by the main themes of the Egypt

Human Development Reports (EHDRs) for 2003 and 2004, which are 'Participation in local development' and 'Decentralization and Development' respectively. Moreover, Egypt's Fifth National Five-Year Plan for 2002-2007 is committed to community participation and decentralization in decision-making. Furthermore, general issues of poverty and disparities are addressed throughout the plan's objectives as shown in Table (5-1) (Ministry Of Planning 2002).

- *Deepening of democracy and participation*: Higher degree of decentralization in decision-making processes, with effective civil society participation. Aligning the political system with the developments in practicing democracy and participation, opening up to global changes: Constitutional changes where necessary, deeper contact between political parties and the people.
- *Developing the participatory planning methods*: Deepening the role of participatory planning, managing the development process to rectify market mechanisms' failures in resource management and allocations, developing the information system to support the planning decisions.
- *Developing the rules and mechanisms for accountability, monitoring and transparency*: Optimum use of resources, transparency and disclosure of data
- *Civil service reform*: Achieving a suitable civil service size and capacity.
- *Legislative reform*: Aligning the legislation with local and international inputs, completing the legislative infrastructure for new fields.

Table (5-1): Objectives of Egypt's Five Year National Plan (2002-2007)

5.1.1 Participation as a mechanism for reform

Over the past 30 years participation in development has gained legitimacy and respectability. The World Commission on Environment and Development (WCED) emphasized; sustainable development requires *"a political system that secures effective citizen participation in decision-making"* (WCED 1987). Moreover, in the context of rural development, Conroy and Litvinoff argued that a participatory approach, involving local people in decision-making and implementation, is a key factor in sustainability (Conroy and Litvinoff 1988, p287).

Today it would be difficult to find a development forum, which did not have the discourse of citizen participation as a core feature of its proceedings. It has become an equal competitor to the sustainability discourse in its famousness and popularity. Participation can be defined as:

"Members of the public taking part in any of the processes of formulation, passage and implementation of public policies"
 (Stoker 1997)

Participation opens the door wide for developing people's capabilities and empowering people in general and vulnerable and marginalized groups in particular to express their needs and interest and convey their voices to the decision-makers, who usually take the decisions that affect their lives. Moreover, participation provides better chances for optimum resource allocation, appropriate technological choices and elaborating and implementing development plans that respond well to society's goals and expectations.

In Egypt, most forms of public participation take place through civil society organizations which involve a diverse group of agencies, organizations and NGOs. They also include cooperatives, workers' syndicates, professional unions and opposition political parties. Generally, these forms have limited self-perceptions and capacities and their role is underutilized. Civil organizations in Egypt are independent, non-profit making, and non-political (United Nations Development Programme and the Institute of National Planning 2003).

With respect to rural Egypt, the first and the most significant practice of participation is the "Shorouk Program", which has been started in 1994. It is considered a 'best practice' example of an integrated rural development program that emphasizes grassroots participation in all stages of the development process: planning, financing, reasoning and executing. Grassroots participation is considered a strategic goal, not just a tool. It is worth mentioning that Shorouk Program requires the citizens of the local community to provide tangible contributions to the projects undertaken through the program in their villages, in terms of either physical efforts or monetary donations (UNDP, ORDEV et al. 2003, p29).

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The second optimistic initiative in the same direction is the new methodology (started 2005) adopted by the GOPP in 'The National Project for Preparing the Strategic Plans for Egyptian Villages'. This methodology is based on a participatory approach which engages the grassroots in identifying their problems, needs and development priorities. A broad explanation of "Shorouk Program" and the new planning methodology will be illustrated in the following sections.

5.1. 2 Decentralization as a mechanism for reform

Centralization is considered one of the main impediments to promoting development. The importance of decentralization lies in its association with the transfer of competence and the independence of decision-making, with the purpose of raising the quality of basic service delivery. There are three aspects to this transfer of power as identified in EHDR (United Nations Development Programme and the Institute of National Planning 2004, p1):

- Political decentralization, which relates to a greater degree of democracy at local levels to ensure a high degree of community participation in decision making,
- Administrative decentralization, which shifts the decision-making authority to lower levels in the administrative hierarchy to respond to the needs of citizens, and
- Fiscal decentralization, which provides greater discretion in the mobilization and spending of funds – to make better use of resources.

In fact, the development impediments in rural Egypt are primarily affected by the administrative and fiscal centralization. However, to realize progress towards their decentralization, political decentralization has to come first.

One of the main recommendations addressed in EHDR (2004) is to shift authority from central to local government, as a major reform that would endorse public participation and promote better resource mobilization. Much literature supports this recommendation such as Ravetz (2000, p260). This shift not only involves the transfer of power from top to bottom but also requires changing roles for the two levels: the centre should withdraw from service delivery and concentrate on setting

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standards and regulation, while the local authority should be empowered to carry responsibility and accountability for service delivery. This requires preparing local capacities to perform new functions. Though national policies responded positively to calls for participation and engaging the grassroots in local development, the attitude is dissimilar with regard to decentralization. The central government still combines the roles of planning, budgeting, financing, resource allocation, regulation, monitoring, evaluation and service delivery, while local government has little, if any, authority over matters of relevance to local communities (United Nations Development Programme and the Institute of National Planning 2004).

5.2 Development Initiatives

Rural areas have been left out of development initiatives for a long time. The 1952 Revolution was the first determining event, which stimulated the occurring of major changes in rural Egypt such as the issuing of the agrarian reform laws and applying the local administration system in 1960. During the eighties and early nineties, the villages witnessed a considerable number of programs and sectoral projects, which resulted in partial economic and social changes. In 1994, the Shorouk program started its implementation, which is considered a prominent confirmation of an optimistic beginning of reform concerning rural areas. In 2002, a national project sponsored by the GOPP-MHUUC took place to prepare the instructional development plans for Egyptian villages. Although, the project was a genuine initiative to promote sustainable development in villages, the adopted methodology had some defects, primarily neglecting the role of the public. The old methodology worked in a complete isolation from the grassroots. As a positive response to the defects of the old methodology, as well as to the rising calls for the necessity of grassroots participation in local development, in 2005 the GOPP adopted a new planning approach based on public participation for preparing the strategic plans for Egyptian villages.

5.2.1 Shorouk: A Local Development Experience through Participation (1994)

The 'Shorouk Program' proceeds from a specific vision of rural development, as a planned progressive change process towards the general upgrading of all aspects of life in the local society, performed by the citizens in a democratic framework, with technical and financial assistance from government. It is considered a 'best practice' example of an integrated rural development program that emphasizes grassroots participation in all stages of the development process: planning, financing, reasoning and executing. Grassroots participation is considered a strategic goal, not just a tool (United Nations Development Programme and the Institute of National Planning 2003). It guaranteed for the first time in the history of the country the allocation of specific amounts of public funds to each village unit, based on the size of its population and suitable to its development rate, with regards to its value of the HDI. These investments are controlled and directed through wide citizen participation (UNDP, ORDEV et al. 2003, p30).

5.2.1.1 Program Objectives

The strategic goal of the 'Shorouk Program' includes two aspects that should be achieved in parallel. *The first* is to steadily upgrade the quality of rural life to reach a quality of life equal to that of the city. *The second* aspect is to promote and develop the concept of public participation in the development process: to cover conceptualizing, planning, financing, executing and evaluating

In this way, it aims to transform the rural citizen from a receiver to a doer, a creator and partner in the development process, as a means of ensuring the persistence and sustainability of development.

5.2.1.2 Program Mechanism

The program operates through a hierarchy of national, regional, and local level coordination mechanisms that guarantee the participation of all local social categories. The program's executive organs start from the level of residential squares in all rural areas all over Egypt till the level of experts and technical committees, Table (5-2) indicates the mechanism of the program. The program stages are implemented in every local unit as shown in Figure (5-1).

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The Committee	No. of committees	No. of members
Representatives of Shorouk	1130	23117
Shorouk committees in local units	1130	33746
Shorouk committees for rural women	1130	11632
Shorouk committees of administrative markaz	185	6735
Shorouk committees in governorates	26	765
Central coordination committees	4	108
Technical Committees	1	30

Table (5-2): Mechanisms of Shorouk Program

Figure (5-1): Shorouk's National Strategy. Source: (United Nations Development Programme and the Institute of National Planning 2003)

5.2.1.3 Achievements of 'Shorouk Program'

During the period from 1994 to 2002 of the Shorouk program, there have been many concrete achievements in all villages especially with regard to the rural citizens themselves and their concerns. Visible changes in participant's perceptions, attitudes, and social commitment have occurred over the eight years. This was apparent from the high cooperation of citizens while carrying out the national project for preparing the strategic plans for Egyptian villages[8].

Program implementation has included a training component to orient all committees' members and local leaders. Total program investments have reached LE 1877.8 million, of which LE 545 million are public participation comprising **29%** of total investments. Table (5-3) presents the investments of the program distributed over the main development sectors. The major role that Shorouk has played, especially in infrastructure investment can be clearly noticed.

5.2.1.4 Obstacles and Problems

Although there have been many concrete achievements of the 'Shorouk program', it has faced many problems and obstacles, which have constrained its output and reduced the benefit of projects and activities. They can be summarized principally in the deficiency of training administrative and organizational mangers, and insufficient governmental finance to achieve the desired development result. Besides, this program is regarded as a sectional program that competes with other ministries' programs in the field of rural development. Furthermore, initial implementation took place quickly and then its executive time schedule in all the villages was revised and expanded without a proportional increase in funds. As a result, the average share of the local rural unit from the funds has decreased. Moreover, the range of projects has become restricted to only specific kinds of projects such as water projects, leading to a diversion from the initial path of the project as it aimed to respect people's needs and desires (United Nations Development Programme and the Institute of National Planning 2003).

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[8] This opinion represents the researcher's point of view based on the experience of working in the mentioned project.

Sector		Total Investments		No. of Projects
		Million L.E	%	
Infrastructure	Clean Water	538.9	28.7	13102
	Sanitation and Environment	428.8	22.8	9846
	Ways, bridges and Communications	352.00	18.7	2642
	Electricity	105.00	5.6	3174
	Total Infrastructure	**1424.7**	**75.9**	**28764**
Human Development	Woman & Child Development	91.4	4.9	1652
	Youth Services	46.4	2.5	519
	Education Services	46.00	2.5	631
	Health Services	41.00	2.2	211
	Religious Services	27.1	1.4	532
	Cultural Services	18.5	1.0	95
	Performance Enhancing	35.8	1.9	489
	Total Human Development	**306.3**	**16.3**	**4129**
Economic Development	Animal & Poultry Production	51.2	2.7	20106
	Craft & Industrial Workshops	32.3	1.7	5049
	Agricultural Machinery	15.6	0.8	2566
	Transportation of Goods	12.4	0.7	1394
	Software and Computers	10.1	0.5	5044
	Marketing places	5.9	0.3	2015
	Milk & Honey	5.7	0.3	2837
	Agricultural Technology	3.4	0.2	939
	Other Projects	10.3	0.5	3295
	Total Economic Development	**146.8**	**7.8**	**43245**
Total		**1877.8**	**100%**	**76138**

Table (5-3) Investment distribution of the 'Shorouk Program' by rural development sectors and number of projects during the period from 1994 - 2002

Nonetheless, it cannot be denied that this work methodology was a step in the right direction towards more public participation.

5.2.2 The Instructional Physical Development Plan for Egyptian Villages (2002)

In 2002, a national project sponsored by the GOPP – MHUUC took place to prepare the instructional physical development plan for Egyptian villages. The main goals of the project are to support development initiatives in rural communities and organize the urban actions to realize the following objectives:

1. Protecting the agricultural land
2. Narrowing the rural - urban gap
3. Improving the conditions of the rural society
4. Supporting the national economy

Notwithstanding, the objectives have emerged from a thorough understanding of the sustainable development concept, the adopted methodology neglects a main factor to promote the success of the development process, which is the role of the public. The adopted methodology worked in complete isolation from the grassroots. The development plans of villages reflect only the points of view of the team who prepared them, with no influence from the local citizens, who in reality will be affected by the development process.

Another defect in the adopted methodology is its neglect to the real situation in terms of village expansion beyond the physical demarcation of 1985. The development plan concerned only the physical mass inside the area within the physical demarcation of 1985, while the village's expansion outside this demarcated area is considered an illegal encroachment on agricultural land and should be demolished. Then, reallocate people must either move inside the boundary of 1985 to be accommodated by vertical expansion (Taktheif), or move into new settlements near to the village. Service buildings are the only type of buildings, which can be kept. Theoretically, this might be valid, but practically, it would be impossible to happen. The expansion outside the physical demarcation of 1985 exceeds in many villages the original area defined inside the boundary of 1985. Moreover, from an economic point of view, the cost of re-use of these lands as cultivated land hugely exceeds the cost of reclaiming desert land. Furthermore, demolition will not affect buildings only, but people as well, which resulted in it becoming an unrealistic concept.

As a positive response to the defects of the methodology of 2002, as well as to the rising calls for the necessity of grassroots participation in local development, The GOPP adopted a new methodology in 2005 for preparing strategic plans for Egyptian villages and it is ongoing now.

5.2.3 The Strategic Plans for Egyptian Villages (2005): The Participatory Planning Approach

In 2005, the GOPP adopted a new methodology based on a participatory approach, which engages the grassroots in identifying their problems, development priorities and the required projects as well as the borders of the physical demarcation of the village, which is the key issue in organizing the development of the villages. The GOPP referred to the previous experience of the UN-HABITAT (RUSPS project)[9] (UN-HABITAT 2004) and the ORDEV in developing the new methodology.

5.2.3.1 Methodology Objectives

The participatory planning approach aims to estimate village's needs and to identify a new physical demarcation, which is based on the current condition rather than the one of 1985, as an approach to prepare the village strategic development plan. This plan provides a future vision to develop the village in the different sectors (economic, social, environmental and urban) by the agreement of all stakeholders to cooperate with each other to execute the future plan. The main objectives can be summarized as follows (GOPP 2005a):

1. Protecting agricultural land (about 500,000 feddan) from haphazard urban sprawl, especially within Lower Egypt,
2. Guaranteeing planned development of the village, by the rational exploitation of agricultural pockets and vacant land to provide the required housing and services for the prospected population increase,

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9 RUSPS is a project titled "Regional Urban Sector Profile Study for Policy inputs for Urban Poverty Reduction in Africa and the Arab States". Egypt is one of 25 countries that the project is implemented in. The study performed a fast-track profiling of selected cities on common concerns or urban issues, more importantly for providing insight into the gaps, constraints and challenges currently hindering institutions at various levels and spheres. The development of city profile was verified in a mini-city consultation. Four main crosscutting themes/issues are analyzed to address urban management and poverty reduction, including: (1) Shelter and Slum Conditions, (2) Urban Governance, (3) Gender, and (4) the Urban Environment. The researcher was one of the UN-HABITAT team who had accomplished the city profile of 2 Egyptian cities (Suez and Alexandria) in the period from June 2004 to March 2005.

3. Solving the problems of 15 million persons (3.4 million family), who have built informal dwellings outside the physical demarcation of 1985, through developing a new physical demarcation recognizing the current conditions.
4. Promoting the sustainable development of the Egyptian village with its thorough conception through a participatory planning approach.
5. Empowering local society to execute decentralization and public participation policies to achieve more progress in urban management and society development, and
6. Improving people's living conditions, wherein the new plan allows providing infrastructure to all areas.

5.2.3.2 Methodology Framework

The adopted methodology is principally based on *establishing a decentralized system and guaranteeing the participation of all stakeholders, especially the civil society.* The basic steps included in the methodology framework, as shown in Figure (5-2) can be summarized as follows:

- Defining stakeholders
- Conducting Interviews with the various groups of stakeholders
- Identifying problems, needs and priorities
- Workshops to get stakeholders' conformity on the development strategy

- *Defining stakeholders*

The term 'Stakeholders' refers to groups, organizations (formal and informal) and individuals, who have an important 'stake' in the development process and sometimes referred to as 'actors' in the process (The United Nations Centre for Human Settlements (UNCHS Habitat) 2001). Based on this definition, stakeholders in the context of the rural Egypt, who have an important 'stake' in addressing the development priorities and the main issues of interest are classified under four main categories as follows (GOPP March 2005, Appendix 2):

Interviews with the various groups of stakeholders

Preparatory work

Primary data collection

Secondary data collection

Urban Survey Work

Estimation of needs Current/Future

Identification of problems/needs

Possibilities & Restrictions

SWOT Analysis

Identification of issues and objectives

Preparation of projects list & the required areas for expansion

Presentation of analysis results: problems, needs and priorities

Agreement on the main issues and objectives

Initial vision of the size of stakeholders' contribution in implementation

Projects' allocation within the new physical demarcation

Assemblage of the common issues and objectives

Agreement on the priorities of the development projects in the village

Workshops

Presentation of workshops' results to get stakeholders' conformity on the development strategy

Figure (5-2): Methodology Framework

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1. ***Local Governance Sector***: the local authority, administrative units, sectoral committees (health, education, transportation, etc.), educational institutions, utilities organizations, social fund organization, and the international fund institutions.
2. ***Private Sector***: Village Development Bank, agricultural societies, (minor, minute, middle and macro) economic enterprises, trade and labor cooperatives, land development institutions, banks, credit and financial institutions, commercial chamber, press agencies, supportive economic groups, labor societies, private utilities companies, and private educational institutions.
3. ***Non-Governmental Organizations NGOs***: local service organizations, Village Development Society, Orphan Supportive Society, local educational institutions, local religious groups, international development groups, Labor Females organization, representatives of vulnerable and marginalized groups (women, poor, disabled, etc.), and environmental groups, etc.
4. ***The Public***: informal sector groups, village groups, large families in the village, etc.

- ***Conducting Interviews with the various groups of stakeholders***

To guarantee the freedom of expression for all stakeholders to convey their point of views, with regard to the development issues, separate structured interviews with the defined four groups are conducted. A questionnaire of 105 questions covering the main development sectors within the village context is conducted through these interviews, (see Appendix C for the full form of the questionnaire). The main purpose of conducting these interviews is to explore how the current processes work within the village context, the current problems in different sectors and the suggested solutions for solving these problems, as well as the citizen's needs and development priorities. The questions are organized below 5 main themes as follows:

1. Local Governance Development
2. Urban Development
3. Economic Development
4. Social Development
5. The Environment

In parallel with this phase, data collection and urban survey of the village are to be carried out by the working team.

- *Identifying problems, needs and priorities*

Responses of the different stakeholders are then analyzed to identify their needs, priorities as well as their problems, which constrain the development process. The adopted analytical technique is the SWOT (Strength – Weakness – Opportunities – Threats) tool of analysis. The results of this analysis should provide alternative solutions, activities and projects to tackle the specified problems and the issues of concern and to promote the development process in the village.

- *Workshops to get stakeholders' conformity on the development strategy*

Carrying out workshops with the various groups of stakeholders to get their agreement on the issues, objectives and development projects is an essential phase in the adopted methodology. The workshops include the following tasks:

- Presentation of the results and findings of the interviews through a broad meeting in the village, with the presence of all the stakeholders. The presentation should demonstrate the development priority issues in each sector and the proposed projects and activities. Through the meeting, stakeholders are encouraged to amend any of the findings within an open discussion.
- Resolve any conflict between the different stakeholders, with regard to identifying priorities and get a final agreement on the main issues of concern, objectives and development projects.
- Final presentation to get stakeholders' conformity on the development strategy. The same process should be repeated for the other villages within the same administrative unit. A final meeting should take place on the level of the administrative unit with representatives present from the included villages.

The working of the above mechanism started in March 2005 and it is ongoing now. In the period from April to September 2005, 497 villages on the national level have been accomplished the strategic development

plans, which called the urgent phase. The time schedule aims to accomplish the remaining villages for all Egypt (4060 villages) by the end of December 2008; 1200 villages per fiscal year 2005/2006, 2006/2007, 2007/2008 and 460 from July to December 2008 (GOPP 2005a).

The author believes that, the current planning approach concerning rural areas is a positive initiative from the government for responding to the rising calls for decentralization and participation as mechanisms for reform, which are explained earlier in this chapter. It is considered a truly serious step in practicing participation, following the first initiative in the Shorouk Program. Currently, the grassroots are engaged in deciding their destiny after a long era of alienation and marginalization. Moreover, empowering local society to carry authority and accountability for actual development activities is of the central focus of this approach.

However, it has to be kept in mind that current participatory approach relative to the thorough conception of participation, is still far away. The next section provides a successful example of how practicing participation in rural development planning should be and how the transformation from a 'blueprint' approach to the 'learning – process approach' should take place.

5.3 Guidelines of Successful Sustainable Rural Development

Chambers put forward five major pre-requisites for sustainable rural development on the basis of analyzing five case studies, which represent apparently successful and sustainable projects in the developing world (Chambers 1988, pp 8-13). These principles can be summarized as follows:
1. A learning-process approach
2. People's priorities first
3. Secure rights and gains
4. Sustainability through self-help
5. Staff calibre, commitment and continuity

It can be clearly inferred from these principles that there is great emphasis on the importance role of involving the people and on the flexibility in evolving and modifying plans while development proceeds. Adopting a 'learning – process approach' in rural development planning is in direct contrast to the 'blueprint' approach which has dominated many planning activities in the past. The key features of each approach are identified in Table (5-4).

	Blueprint	Learning process
Idea originates in	Capital city	Village
First steps	Data collection and plan	Awareness and action
Design	Static, by experts	Evolving, people involved
Supporting organization	Existing, or built top-down	Built bottom-up, with lateral spread
Main resources	Central funds and technicians	Local people and their assets
Staff training and development	Classroom, didactic	Field-based learning through action
Implementation	Rapid, widespread	Gradual, local, at people's pace
Management focus	Spending budgets, completing projects on time	Sustained improvement and performance
Content of action	standardized	Diverse
Communication	Vertical: orders down, reports up	Lateral: mutual learning and sharing experience
Leadership	Positional, changing	Personal, sustained
Evaluation	External, intermittent	Internal, continuous
Error	Buried	Embraced
Effects	Dependency creating	Empowering
Associated with	Normal professionalism	New professionalism

Table (5-4): The contrasting 'blueprint' and 'learning-process' approaches to rural development. Source: (Chambers 1993) cited in (Elliott 1999, p 122)

Making the rural poor the starting point in the development process and to put the priorities of the poor first of all is crucial for promoting sustainability. Ensuring that the individuals have secure rights to resources with focus on issues of land ownership and tenure are key issues for increasing benefits and productivity. It is suggested that participation in change should be entirely voluntary and without any form of inducement or subsidy. Finally the fifth principle stresses the importance that the staff involved should be of high caliber and commitment to working with and for the poor; their continuity although is difficult but is more favorable. The staff that is capable of such sensitivity and reversal of normal values is often most at home in NGOs rather than the government staff. Evidence from the case studies which are investigated by Chambers, that NGOs staff is better able to understand and represent the point of view of rural people while it is difficult for the government staff to have a close relationship with the local people.

5.3.1 The Participatory Rural Appraisal Approach

Chambers is one of the main proponents of the Participatory Rural Appraisal (PRA), which seeks and stresses power reversals between uppers and lowers. Most of those who have innovated in developing the PRA have been practitioners, concerned with what works and what will work better, not academic theorists concerned with why it works. In this approach, initiatives and control are passed to local people, using the metaphor of 'handing over the stick' (or chalk, or pen). It emphasizes reversals of power from outsiders as uppers to local people as lowers by shifts of orientation, activity and relationships as follows (Chambers 1997,pp 147-154):

1. *From closed (pre-set questions) to open (participatory mapping and modeling):* from the knowledge and values of outsider professionals to those of insider local people. In contrast with questionnaire interviews, semi-structured interviews are more open, conversations more so, and PRA mapping and diagramming are most open of all, as shown in Figure (5-3).
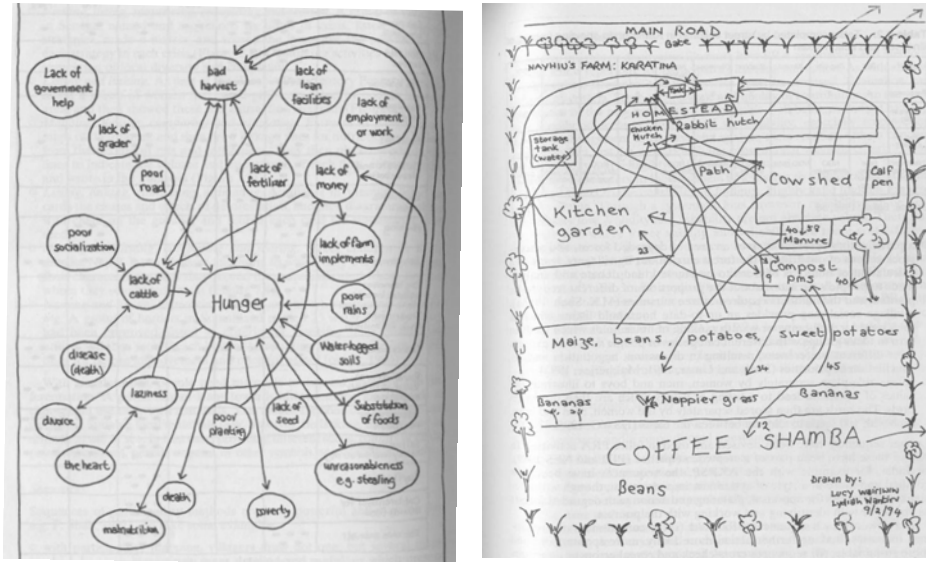
Flow diagram of causes of hunger by 22 women, Hamaumbwe Village, Monze, Zambia, October 1993

A farmer's nutrient flow diagramming on her farm map, Karatina, Kenya, 1994

Figure (5-3): Examples of participatory mapping and diagramming.
Source: (Chambers 1997, pp 138-39)

2. *From measuring to comparing*: measurement means absolute values to indicate trends or changes, while comparison means relative values to indicate reflection or judgment without formal baseline data. In PRA, comparing is more favorable, as it is usually easier, quicker, cheaper and less sensitive than measuring.

3. *From individual to group*: in PRA, discussions with individuals can and do take place, but there is relatively more attention to groups and participatory analysis by groups. Groups often build up collective and creative enthusiasm, fill in gaps left by others, and add and correct details.

4. *From verbal to visual*: in contrast to questionnaire surveys and semi-structured interviewing where most of the transfer or exchange of data is verbal, information shared in participatory mapping and diagramming is visual and often created as a group activity. Visual methods can also be empowering for those who are weak, disadvantaged, illiterate and marginalized.

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5. *From higher to lower:* from paper and table to ground reduces the dominance of the few who hold pens, sit at tables and encourages and enables more to participate who speak less and who are less literate. Lowers usually gain confidence and feel more freedom with using the ground rather than papers, using soils, stones, seeds as counters and using sticks as measures. Evidence proved that local people have shown a far greater ability to map, model, observe, list, count, estimate, compare, rank, score and diagram than most uppers or outsiders had supposed.

6. *From reserve to rapport, and frustration to fun:* with upper-lower interactions, there is a scale of formality-informality, from structured interviews with questionnaire, through the semi-structured interview with a checklist of subtopics to the open-ended conversation. With interviews, uppers ask questions, maintain control and largely determine the agenda or categories. The PRA stresses the process of gaining empathy for lowers. Lowers usually find the process of expressing what they know and what they want interesting and pleasant, fun is often part of PRA.

The author believes that Chambers guidelines for successful sustainable rural development and the PRA are ideal mechanisms. For a country like Egypt, where practicing participation is in its infancy, it would be difficult to follow these ideal guidelines literally. The purpose of referring to Chambers guidelines is not for comparison, but rather to indicate the extreme positions: ultimate participation (Chambers guidelines) and first step participation (GOPP participatory planning methodology). With respect to the unique circumstances of rural areas in Egypt and the long-lasting justice they have suffered from, the new methodology is considered a successful first step towards promoting sustainable development and overcoming peoples' feeling of alienation, which needs to be supported and enhanced by the various actors. However, putting Chambers guidelines and PRA as an ultimate goal or desired direction will stimulate more initiatives towards improving the current practice of participation.

5.4 Conclusion

Exploring the suggested mechanisms for narrowing the rural – urban gap and overcoming the development constraints in rural Egypt indicates that participation and decentralization are widely seen as key mechanisms for reform and promoting sustainable development in Egypt in general and rural areas in particular.

Notwithstanding, there is a tangible progress on practicing participation in rural Egypt, the position is dissimilar with regard to decentralization. The central government still combines the roles of planning, budgeting, financing, resource allocation, regulation, monitoring, evaluation and service delivery, while local government has little, if any, authority over matters relevance to local communities.

Exploring the evolution of remarkable development initiatives concerning rural Egypt started from the revolution of 1952, to applying the local administration system in 1960, to the sectoral projects through the eighties and early nineties, then the Shorouk Program (1994), to the national project for preparing the instructional development plan for Egyptian villages (2002) and finally the current participatory planning approach (2005) adopted for preparing the strategic development plans indicate growing concern towards improving the conditions of rural Egypt. Moreover, the current participatory planning approach is considered a positive response to the rising calls for the necessity of engaging the grassroots in deciding their destiny after a long era of alienation and marginalization. Grassroots are currently involved in identifying the problems, priorities and needs required to promote the development process in their village.

However, investigating other successful examples of practicing participation in rural development planning such as the PRA indicated that there is a wide gap between the current participatory approach and the thorough concept of participation. Nonetheless, it cannot be denied that the current planning approach was a successful step in the right direction towards more public participation, which needs to be supported and enhanced by the various actors. Moreover, putting the PRA as an ultimate goal or desired direction would be useful to stimulate more initiatives towards improving the current practices of participation.

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Part (2): Application

Chapter (6): Methodology

Introduction

The ultimate goal of this research is to develop a sustainability indicators set appropriate to the context of the Egyptian villages to assess their progress or decline on the path of sustainable development. Therefore, it can be a guiding policy instrument for decision and policy makers, donors and concerned authorities in drawing up policies, monitoring development and allocating resources on a solid basis

This chapter sets out the development of the research methodology in attempting to realize the research aim and objectives as well as to answer the research questions in an appropriate, valid and coherent manner. It starts with summarizing the key findings from the literature review principally in terms of gaps in current attempts to assess communities' progress on the path of sustainable development and key problems in rural areas in Egypt. Following this is a justification of the research's adopted theoretical approach in developing a process for identifying a set of SIs appropriate to the Egyptian village context and a reasoning of the adopted application process. Research methods are then explained, with clarification of why these particular methods are chosen to carry out the process of developing and applying the key representative SIs set. It ends with explaining data sources and selection criteria of test sample villages within the limitation of data availability and research time length.

6.1 Summary of Literature Review findings

Reviewing current literature that formulate the discussion on SIs indicated that they used to fall into two main theoretical paradigms; the 'Reductionist' and the 'Participatory' paradigms. Moreover, in the last few years the third paradigm the 'Adaptive Learning Process' or the 'Integrated Methodology' emerged, which calls for integrating approaches from different paradigms to offer a holistic approach for measuring progress towards sustainable development. On the other hand, investigating the application of SIs in practice by analyzing a number of

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projects, which attempt to develop sets of SIs indicated that there are always gaps in modelling the issues. The majority of projects neglect the complexity of the interrelationship between the various factors of influence, resulting in rigid frameworks that misrepresent the real complex system. Therefore, there is a need to fill this gap by integrating a kind of systems mapping, as a means to depict the complex system, with its social, economic, environmental and institutional components. A 'Systems Thinking' approach and its tools as explained in chapter 3 proved to be valid to fill this gap.

Furthermore, there is a significant debate regarding the technique in how indicators indicate performance; individual indicators versus indices. The advantages and disadvantages of both techniques are explained in sections 3.2.7.1 and 3.2.7.2. Within the context of this research, village performance will be assessed by both techniques to indicate how the findings vary considerably from one technique to another and how this affects the conveyed message to target audiences significantly.

Though the importance of SIs and the powerful role they can play in assessing development achievements and allocating resources on a solid basis, these indicators are lacking in Egypt. Exploring the current systems for assessing development achievements of rural communities indicates that the HDI is the only well known tool of assessment. Reviewing the methodology behind elaborating the HDI indicates that the HDI along with its supplementary indicators reveals only the social and economic dimensions, while the environmental and institutional dimensions are completely neglected. These dimensions are of crucial importance within the context or rural Egypt. It can be recognized from the literature of the nature of rural Egypt that the real threat falls in the environmental dimension in terms of severe encroachment on agricultural land, which is salient and has to take the first priority in policy intervention and the main development constraints fall in the institutional dimension in terms of rigid legislation and bureaucracy.

Therefore, this research aims at developing an enhanced policy tool, which encompasses all the dimensions thoroughly in order to provide decision makers with a holistic vision about the current conditions of rural communities. Sustainability indicators seem an appropriate tool to

capture the various dimensions of the rural system thoroughly. Moreover, developing these indicators with input from different stakeholders is essential to adapt with the current calls for participation as a mechanism for reform and promote sustainable development in Egypt in general and in rural areas in particular.

6.2 Justification of the Adopted Theoretical Approach

The adopted theoretical approach in this research to develop a SIs set appropriate to the Egyptian village context is grounded in the work of Mark Reed, Evan D. G. Fraser, et al. (forthcoming); the *"Adaptive Learning Process"* or *the "Integrated Methodology"* paradigm and the work of Munda (2004); the concept of *Social Multi-Criteria Evaluation (SMCE)*. Moreover, the guidelines of practical procedures for developing SIs identified by Bossel (2001) has a central role as well.

Mark Reed, Evan D. G. Fraser, et al. attempted to alleviate the weakness of both the "Participatory" and the "Reductionist" paradigms in developing SIs on the local scale and simultaneously build upon the strength of both of them, (see section 2.3.3 for a more detailed explanation of the "Integrated Methodology" paradigm).

The SMCE also calls for a decision-making process using information coming from a multi/inter disciplinary work and participatory approaches. Therefore, the problem is structured in a multi-criteria fashion considering several perspectives, (see section 2.3.3 for a more explanation of the SMCE concept).

With regard to the Egyptian village, engaging the public in identifying their priorities and issues of concern is extremely essential for two main reasons:
1. To overcome their embedded feelings of alienation and marginalization, which have accumulated over the past decades. Therefore, it is important to create a participatory atmosphere in which stakeholders feel their perspectives and knowledge are valued, and an understanding that their sharing is expected to yield results beyond the accumulation of information.
2. To guarantee that the identified problems, goals and priorities represent reality, as they are identified by the locals, who are

actually influenced by development and not by mythical decision makers, who take decisions in the central government away from the real events.

However, there is a danger that if the locals control everything and if they fall prey to the same beliefs and values that have led to current unsustainable positions i.e. their goals and priorities are not consistent with the principles of sustainable development, then, the findings may not enhance sustainability. In addition, if indicators developed exclusively through participatory techniques and, with the fact that practicing participation in Egypt is in its infancy, the outcomes may not have the capacity to accurately or reliably monitor sustainability. Moreover, this would lead to different indicators sets for different localities, whereas what this research seeks is a unified set of indicators that can be applied across rural Lower Egypt and can be an effective policy tool.

Therefore, integrating researcher's skills in identifying, selecting, revising, testing and applying indicators will undoubtedly augment local knowledge and guarantee the accuracy, sensitivity and reliability of indicators. The inclusion of both lay and scientific knowledge is vital in achieving the hybrid knowledge required to provide a better understanding of the environmental, social, economic and institutional system interactions.

Moreover, modelling these interactions can help to highlight problems, which allows decision-makers to prioritize interventions, where small changes can make tangible and significant impacts.

The adopted approach in this research: the 'integrated methodology' emphasizes the inclusion of the public in all the phases of the process as a means to generate indicators more relevant to the local context, reflect the local perceptions of the rural system and enhance community capacity for learning and understanding. However, due to the reasons specified in the preceding paragraphs, stakeholders are only engaged in identifying their key issues of concern, problems and priorities, while the rest of the process including; identifying, selecting, revising, testing and applying indicators is carried out by the researcher exclusively. The

researcher believes that carrying out the process in this manner would be *pragmatically more adequate* for the rural nature in Egypt. Following the adoptive approach literally would not serve the purpose of this research, but allowing some modification of the approach to adapt to the real situation on the ground would be definitely more helpful to the research context.

However, it has to keep in mind that with further experience of practicing participation in Egypt by experts and people, stakeholders' role should be enlarged. They should be involved in all phases of the process. Further clarification of the possibility of applying this approach in future real situations will be discussed in detail in the final chapter.

6.3 Reasoning of the Adopted Application Process

This section explains the rationale behind elaborating the three sets of indicators, which are composed through the application process: *comprehensive, core* and *provisional* sets of SIs. Each set is established to fulfil a certain purpose. They are developed consecutively.

Referring to the discussion held in sections 3.2.3 and 3.2.4 with regard to the target audience and the appropriate number of indicators, the argument basically was about how different users are looking at different things in indicator sets. For example, professionals are looking for scientific validity, politicians are interested in policy relevance and the public are concerned with the ease of understanding and personal relevance and how not all will be satisfied by the same set of indicators. Moreover, the appropriate number of indicators to fulfill the needs of different users varies considerably from one target audience to another.

Within the context of this research, the main target audience is policy and decision – makers. However, the SIs set can be used by other users. Establishing a *comprehensive* set of SIs, which capture all the important aspects of sustainable development can provide decision-makers with a comprehensive vision about the current status of a particular village, who need it as an essential accounting system for tracking developing trends. Moreover, it can be of significant interest to other audiences such as planners, who need to learn about and to assess the existing development trends and quantify arguments for planning and development policies.

However, the vast number of indicators contained in the comprehensive set is usually perceived by decision-makers as an undesirable option, which might limit its usefulness.

Therefore, selecting a *core* set of key representative indicators from the comprehensive set of indicators can highlight issues with crucial importance, which should be considered important policy priorities. This will definitely be useful to keep the broad public informed as well as decision-makers if rapid assessment or a comparison between a massive numbers of villages is required. Selecting a core of key representative indicators from the comprehensive set of indicators is not an easy task. The researcher decided to build on the HDI due to its widely well known technique as a measurement system to assess development achievement in a particular region. Building on existing indicators which feed into the HDI will be more acceptable, because it would not require changing the way the HDI data are currently collected. The four indicators composing the HDI represent the economic and social development sectors, in addition to some other indicators that address significant issues within the Egyptian village context. Moreover, a number of indicators are added by the researcher to address the neglected dimensions by the HDI, such as local governance development, urban development and the environment.

In order to examine the applicability of the core set of SIs, data availability is considered an obstacle. Some of the core set indicators lack data and in order to measure villages' performance and practically examine the effect of an integrative set of SIs in providing a holistic vision about the current status, data availability is essential. As a result, substitute indicators, where their data are available, replaced the original indicators that lack data. The new set of indicators is called the *provisional* SIs. It has to keep in mind that the provisional SIs set is for the purpose of obtaining values and results within this research context only, but if an assessment exercise is carried out in reality, the core SIs set should be measured in order to provide, as much as possible, accurate and reliable results.

6.4 Research Methods

This section explains the adopted research methods in order to carry out the process of developing and applying the SIs set. The methodology of this research incorporates elements of both quantitative and qualitative research methods, where each technique fits best in realizing the required purpose in order to make the best use of the data and information available.

The process of developing and applying the SIs is threefold. Its main steps can be summarized as follows:
1. Establishing the 'Egyptian Rural System Model',
2. Identifying the comprehensive, the core and the provisional SIs sets, and
3. Testing the applicability of the provisional set of SIs.

Firstly, establishing the village model is built upon identifying the key issues of concern by different stakeholders. This is based on local level information, predominantly *qualitative*, collected through *structured interviews* by conducting a *questionnaire* (see, Appendix C for the detailed form of questions) to key informants followed by participatory consultations at the village level, with representatives of the various stakeholders to legitimize findings. A detailed explanation of this process is illustrated earlier in section 5.2.3, which includes a description of participant stakeholders, categories of questions and findings of the analysis.

Though the questionnaire encompasses a fixed set of questions which is seen by many researchers as an inappropriate technique (Hobson 2000, p73) because it limits respondents' freedom to reflect their perception. However, the type of questions allows respondents an opportunity to reflect on their own perceptions of what they perceive as problems, constraints or opportunities and leaves open the door for further clarifications. Furthermore, face to face separate structured interviews with the various groups of stakeholders offered flexibility to address each group's unique position and role, their values and opinions. Throughout the interviews, interviewees are allowed to speak freely, no matter if their responses did not fit exactly with the order of questions. This is overcome afterwards during analyzing their responses to classify the

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main problems and categorize development priorities. The main purpose of these interviews is to establish as much as possible a *true*, *adequate* and *reliable* vision about what is going on at the ground level in the concerned village and to specify the urgent needs from the point of view of different stakeholders.

Following this, is modelling the identified key issues of concern. This is carried out in terms of complex circular feedback loops based on the concept of "Systems thinking" to address the linkages among these issues explicitly. The researcher referred to examples of establishing models based on the idea of both "Systems Thinking" and "Systems Dynamic". The main sources of these examples were internet websites (Delta Performance Systems; Aronson 1999; Pegasus Communications Inc. 2000b; STADA 2004; Bellinger 2004a; Bellinger 2004b; Ecoliteracy 2006) and PhD theses (Elrefaie 2003).

Secondly, identifying the comprehensive, the core and the provisional SIs sets is basically relied on the researcher's skills and relative document analysis, which include practical examples of developing and applying SIs. These documents are mainly the five reports of the analyzed examples in chapter (3) (Sustainable Seattle 1998; U.S. Interagency Working Group on Sustainable Development Indicators 1998; Crossroads Resource Center 1999; UNCSD 2001; DEFRA 2005). Moreover, the researcher referred to some other useful material such as (Hardi and Zdan 1997; Percival 1997; Hart 1998-2000; Bell and Morse 1999; David J.Briggs and Connelly 2000; Segnestam, Winograd et al. 2000). An analysis of a number of existing indicator sets is carried out to explore the practical process for developing and applying SIs. This analysis highlighted pitfalls, gaps and problems facing such kind of projects, which are taken into consideration while developing the three sets of SIs. Moreover, the researcher's experience with working on the national project to prepare the strategic development plan for Egyptian villages was extremely helpful in recognizing what is really significant within the village context and has to be addressed in the core set of SIs, and what can be relegated to the comprehensive set of SIs.

Thirdly, testing the applicability of the provisional set of SIs is based on selecting a test sample of villages and an appropriate mathematical

technique to assess villages' performance based on their indicator states. This is carried out through a *quantitative* analysis. A justification of the selected test sample will be illustrated in the following section. As for the adopted mathematical techniques, two different approaches are employed in this research as follows:

- The first approach aims at ranking villages based on their indicator states by aggregating these individual indicators in *one composite indicator*; a Sustainable Development Index (SDI). The adopted mathematical method is called "The Distance from the best and worst overall performers". This method is one of three mathematical methods for ranking explained by Munda (2005). More details of these methods are explained in section 3.2.7.2. Munda concluded after examining his example with the three different mathematical methods that although the mathematical aggregation procedure might improve from one method to another, the end results usually do not change spectacularly. What is more important than the mathematical sophistication is the quality of data and the representative indicator itself. Therefore, the chosen method is selected because of its simplicity and ease of understanding. Villages are evaluated using the new integrative index; the SDI and re-ranked due to their new values. A comparison between the old ranks via the HDI and the new ranks via the SDI is carried out to indicate if the integrative index actually captures the missing dimensions and if these dimensions have a significant influence on the outcomes or not.

- The second approach aims at assessing villages' performance based on their indicator states according to the values of *individual indicators*. The adopted mathematical method is called "The Distance from the Leader Value". The *"Leader Value"* is defined here by choosing the best value reached in any single indicator within the test sample of villages. In this technique, a baseline or a benchmark should be established for every individual indicator in order to assess current performance and monitor progress over time (Riley 2001, p 246). This refers to the discussion held in section 3.2.7 regarding the use of the target, trend or threshold concepts to assess progress towards sustainable development. In this research, baseline is selected instead of target or threshold. The former is excluded because of lack of

information in terms of undetermined policy targets concerning the most of the key identified issues. The latter is excluded because there are always challenges in determining these sorts of thresholds as it is difficult to generalize from one region to another, with significant different characteristics. Therefore, baselines seem to be appropriate within the context of this research.

The results of the assessment are presented graphically by the so-called "radar diagram" to make the interpretation of the results easier. Full details of radar diagrams are explained in section 3.2.7.1. It proved to be a valid tool to visualize changes and enable relative comparisons across a number of cases (Campbell 2001; Schultz 2003). Radar diagrams can be established manually or computerized. In this research, radar diagrams are established in Microsoft Excel.

6.5 Data Sources and Selection Criteria of Test Sample

The data collection process encompasses two data sets. The first one is the data set required to establish the village model and identify the three sets of SIs, while the second one is the data set required to examine the credibility and effectiveness of the provisional set of SIs.

For the first data set, the researcher referred to the findings of the questionnaire conducted through the structured interviews, which are employed in the National Project for Preparing the Strategic Plans of Egyptian Villages sponsored by the GOPP - MHUUS. It ought to be noted that the researcher only participated in the prototype village (Sharabas), which was disseminated afterwards to all universities and institutions that are executing the project. Furthermore, the researcher referred to the findings of a further fourteen villages out of 497 villages which have been carried out in the period from April to September 2005, the so-called the urgent phase. The 497 villages encompass 445 villages from Lower Egypt including 8 governorates; (Demietta, Dakahlia, Sharkia, Kalyoubia, Kafr El-Sheikh, Gharbia, Menoufia, Behera) and 52 villages from Upper Egypt including 4 governorates; (Giza, Menia, Assiut, Suhag) (GOPP 2005a).

The fourteen villages are randomly selected based on their availability from Lower Egypt governorates only to make a representative case of Lower Egypt villages. Similarities amongst villages in Lower Egypt can be noticed from the explanation of the Egyptian villages' characteristics in chapter (4). Furthermore, all national statistics consider Lower Egypt as a whole, while the distinction is only made between Lower and Upper Egypt. It can be seen from analyzing the findings of the questionnaire that almost the main issues of concern are generally similar, while differences only appear in specifying the particular prioritized projects for every village. In this research, the main aim of analyzing the findings is to identify the main issues of concern, which is considered the bedrock to develop the Egyptian village system model and identify the key representative indicators. Therefore, the developed model can be applicable to all Lower Egypt villages.

For the second data set, a group of villages was selected as a test sample, which composes Markaz Shebein Elqanater – Qalyobia Governorate. In choosing the test sample villages, a number of criteria were taken into consideration as follows:

1. The selected group of villages represents a whole markaz. The reason for this is to explore either similarities or disparities in their level of development achievements, given that they are sharing similar circumstances in terms of geographical location, natural characteristics and institutional organization.

2. Moreover, it is essential for the selected villages to have measurements for the HDI to enable comparison between their HDI values and their new values according to assessment by the developed core set of SIs. Exploring the current status of assessing Human Development in Egypt indicates that Egypt has been calculating the HDI at the national level and the governorate level since 1994, as well as at the local level since 2003. At the local level, seven governorates since 2003 have been analyzed at the level of every village, taking into consideration the geographical representation of all regions of Egypt. The seven governorates as shown in Figure (6-1) are: Alexandria, Kafr El-Sheikh, Menoufia, Sharkia, Qalyobia, Fayoum and Assyout, These governorates comprise approximately one third of the total number of villages and cities in Egypt.

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As can be noticed in the classification of the analyzed governorates, they comprise; one Urban governorate (Alexandria), two from Upper Egypt governorates (Fayoum and Assyout) and four from Lower Egypt governorates (Kafr El-Sheikh, Menoufia, Sharkia, Qalyobia).
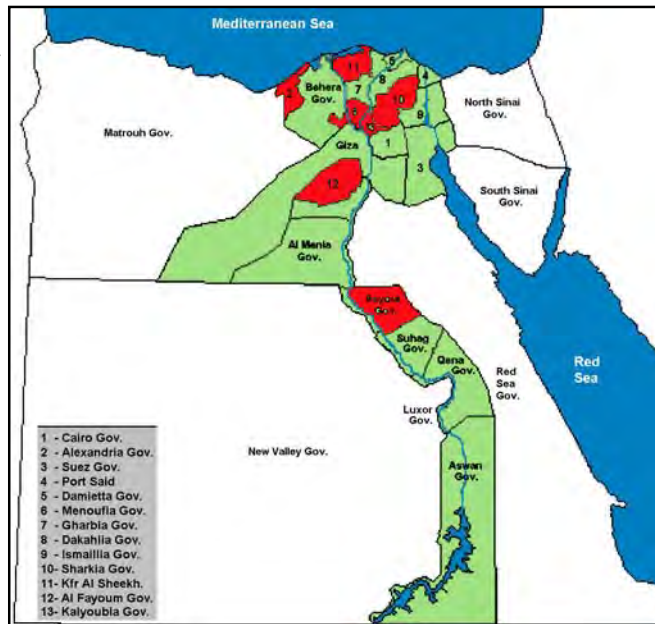
Figure (6-1): Egyptian governorates that have HDI on the village level (2003)

In this case, selection has to be made from the four governorates of Lower Egypt. Due to the availability of data[10], a choice was made between Qalyobia and Sharkia governorates. Finally, Qalyobia is chosen due to the greater awareness of the researcher of the villages' nature in this region, in addition to the high levels of cooperation by the local administrative authorities staff of Markaz Shebein El-Kanater in terms of providing information and facilitating the researcher's mission while carrying out the field survey.

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[10] The researcher relies on the information and data collected by Ain Shams University team as a part of their partnership in executing the pilot project of preparing the Strategic Development Plan for Egyptian Villages sponsored by GOPP-MHUUC. The team has accomplished 76 villages from four governorates of Lower Egypt in the period from April 2002 to May 2005. These governorates are; Qalyobia, Sharkia, Gharbia and Daqahlia. The researcher had accomplished 6 of them; 2 in Qalyobia, 2 in Sharqia and 2 in Gharbia.

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Chapter (7): The Process of Developing Sustainability Indicators

Introduction

This chapter explains the adopted process to establish a model, which envisages the current processes for a typical Egyptian village and addresses the interrelationships between the various system components in terms of environmental, economic, social and institutional components. This model is considered the bedrock for developing a **comprehensive** set of SIs, which in turn considers the basis for selecting a **core** set of SIs. Due to the unavailability of data for some of the core set indicators, substitute indicators with available data replace the lacking ones. This results in a new set of SIs, which called a **provisional** set of SIs. The process comprises eight steps as follows:

- Identifying the purposes of developing the SIs set.
- Defining stakeholders.
- Identifying key issues of concern.
- Defining sustainability goals and objectives.
- Modelling the key issues.
- Identifying a comprehensive set of SIs to represent all of the relevant system components.
- Selecting a core set of key representative indicators.
- Revising indicators based on data availability and developing a provisional set of SIs.

Throughout this chapter, an explanation of each of these steps will be illustrated.

7.1 Purposes of developing the SIs set

The main purposes of developing the comprehensive set of SIs set can be identified as follows:

1. Help assessing either the progress or the decline of Egyptian villages' performance on the path of sustainable development,
2. Monitor and report changes in development trends periodically, and
3. Inform decision making, so that policy makers can draw policies and allocate resources on a solid basis.

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7.2 Stakeholders

Referring to the discussion held in section 3.2.4, regarding either having different sets of indicators for different audiences, or deciding which audience has the priority. In this process, it is decided to be the same set of indicators to be shared by all the stakeholders. For this reason, they all also should share the same goals and objectives of sustainable development. Thus, the participant stakeholders are selected to represent the various groups, who have an important 'stake' in specifying the key issues of concern. They are classified under four main categories as illustrated in the TOR of the National Project for Preparing the Strategic Development Plans for Egyptian Villages (GOPP March 2005, Appendix 2), as follows:

5. ***Local Governance Sector***: the local authority, administrative units, sectoral committees (health, education, transportation, etc.), educational institutions, utilities organizations, social fund organization, and the international fund institutions.
6. ***Private Sector***: Village Development Bank, agricultural societies, (minor, minute, middle and macro) economic enterprises, trade and labour cooperatives, land development institutions, banks, credit and financial institutions, commercial chamber, press agencies, supportive economic groups, labour societies, private utilities companies, and private educational institutions.
7. ***Non-Governmental Organizations NGOs***: local service organizations, Village Development Society, Orphan Supportive Society, local educational institutions, local religious groups, international development groups, Labor Females organization, representatives of vulnerable and marginalized groups (women, poor, disabled, etc.), and environmental groups, etc.
8. ***The Public***: informal sector groups, village groups, large families in the village, etc.

7.3 Key issues of concern

Identifying the key issues of concern, problems and priorities is the underpinning of this process, which will be built upon in the selection of the relevant indicators. Based on the findings of the conducted

questionnaire, a number of key issues and objectives are identified by the different stakeholders under five main crosscutting themes to tackle the main development sectors within the village context as shown in Table (7-1). Four out of the five themes are connected directly to the four dimensions of sustainable development; local governance development represents the institutional dimension, economic development represents the economic dimension, social development represents the social dimension and the environment represents the environmental dimension. For the fifth theme; the urban development, it does not relate directly to the four dimensions of sustainable development. However, due to the crucial importance of urban sprawl and housing problems particularly within the context of Egyptian villages, urban development has been added as a separate theme. Moreover, it has strong cross linkages with the other four themes. For example, educational status belongs to the social development, whereas provision of educational services in terms of schools and educational institutions to fulfil the educational needs is of considerable relevance to urban development.

Theme	Key Issues	Main Objectives
Local Governance Development	Urban Management	• Providing local authority with good management tools • Allowing local authority the right of law enforcement
	Institutional constraints	• Resolving conflicts resulted due to contradictions between laws and legislatives • Improving the highly bureaucratic system
	Financial Resources	• Supporting the local resources for developing the village
Urban Development	Urban Sprawl	• Maximizing the use of vacant and fallow lands in absorbing the population growth
	Housing Supply	• Supplying low-cost residential units

Economic Development	Local economy	• Developing local resources • Stimulating investment opportunities • Ameliorating economic revenue from the cultivated lands • Facilitating the institutional constraints to credit access.
	Unemployment	• Creating additional job opportunities • Reducing the unemployment rate
Social Development	Poverty	• Reducing the percentage of the poor • Improving the income revenue level
	Health Service Conditions	• Improving the performance of the health services • Reducing the rate of patients suffering from endemic diseases • Facilitating accessibility to the specialized medical centers
	Health Status	Improving the level of health status and reduce the percentage of patients suffering from endemic diseases
	Educational Service Conditions	• Improving educational conditions • Reducing class density especially in primary schools • Facilitating accessibility to secondary and technical schools
	Illiteracy	• Reducing the illiteracy rate especially amongst females • Reducing the percentage of pupils leaving schools especially females
	Educational Attainment	Increasing the level of educational attainment especially amongst females
	Violence & Crime	• Providing security and emergency services

The Environment		Sanitary Drainage	• Providing all the buildings in the village with an adequate sanitary sewage system
	Waste Disposal	Solid Waste	• Providing a safe system for solid waste collection from the village • Providing a safe system for agricultural waste disposal
		Liquid Waste	• Providing a safe system for discharging industrial and agricultural waste
	Environmental Quality	Agricultural Land	• Protection of agricultural lands from building haphazard residential units
		Water Quality	• Purifying the water bodies penetrating or surrounding the village and covering sewers as well • Improving the quality of potable water
		Air Quality	• Applying the required abatements to reduce air pollutants' concentration due to burning domestic and agricultural waste
	Risk Exposure		• Securing the village from the risk of high tension electric cables that penetrate residential areas

Table (7-1): Key issues and objectives in the rural sector

For the sake of clarity each objective is presented under one theme and one issue only. In fact, some objectives are repeated by stakeholders below more than one issue such as reducing the unemployment rate, which is repeated under the economic development theme; the issue of unemployment as well as under the social development theme; the issues of poverty and crime and violence. A clarification of linkages between the different issues and a full description of the interrelationships between the various factors of influence is elaborated in the "Egyptian Rural System Model", which will be explained in the following step.

7.4 Sustainability goals and objectives

Bowers argued that sustainability goals, while differing in details between parts of the world, are probably universal, while sustainability constraints and the required actions to promote sustainability depend on the particular conditions of the country or region concerned (Bowers 1997, p184). Derived from the definition of sustainability goals as illustrated at Johannesburg summit (United Nations 2002), and founded on the analysis of the current conditions of the Egyptian village specified in chapter (4), sustainability goals within the context of rural Egypt can be identified as follows:

- *Conserving Natural Resources and the Environment:* the protection of agricultural land from haphazard urban encroachment, as it is considered one of the most precious natural resources at the national level, as well as preservation of water quality and air quality alike.

- *Promoting Economic Growth*: the stimulation of the local economic development, mobilization of resources and elaboration of new financial mechanisms to create more job opportunities, which are appropriate to the market demands.

- *Social Development and Equity:* improvement of the quality of basic public services, narrowing the rural – urban gap on the national and regional level alike and promoting gender equality.

To realize these goals a number of objectives is set out to achieve the posted goals. These objectives are defined based on the identification of needs and priorities by the different stakeholders. Moreover, they are derived from the Millennium Development Goals (MDGs)[11] (United Nations 2005), and adapted to the context of rural Egypt. The objectives are classified below four categories as shown in Table (7-2). The environmental, economic and social categories are corresponding respectively to the three goals of sustainable development. However, the institutional category is added because of its importance primarily, within the context of rural Egypt. Furthermore, it has very strong linkages with

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[11] The Millennium Development Goals (MDGs) summarize the development goals agreed on at international conferences and world summits during the 1990s. At the end of the decade, world leaders distilled the key goals and targets in the millennium declaration (September 2000). The set includes eight goals, 18 targets and 48 indicators to assess progress. The MDGs are to be achieved between 1990 and 2015. Currently, they are an integral part of the UN system's work in the field of development.

the other three categories and achieving progress towards any of them initially requires a progress towards realizing the institutional objectives.

Social	Economic	Environmental	Institutional
• Decrease the rate of population growth • Eradicate poverty • Eliminate illiteracy • Improve the level of education status • Promote gender equality • Improve the level of health status • Provide formal low cost housing units • Provide security and emergency services	• Reduce the unemployment rate • Increase the GDP per capita • Increase the rate of women's participation in labour force • Promote resources mobilization	• Protection of agricultural land • Conservation of water resources • Improving air quality • Ensure that all citizens have access to adequate sanitary system • Improve the quality of potable water • Utilization of sustainable patterns of agriculture • Secure the village from the risk of high tension electric cables penetrating residential areas	• Transfer power to local authority • Get local authority control over resource allocation • Enhance the legislative system and resolve conflicts between the different laws and decrees • Improve the capacity building of local authority • Provide local authority with adequate management tools

Table (7-2): Sustainability objectives in rural Egypt

7.5 Modeling the key issues

From the researcher's point of view, this step is the most significant one in the process of developing the SIs set. If the interrelationships between the key issues are not clear, it would be very difficult to select the most appropriate indicators, which really reflect the status of current processes. Identifying the linkages between the key issues is essential to highlight the actual causes of the current problems and recognize the leverage

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points where minor changes sometimes can lead to considerable improvements in the whole system. Therefore, it is useful to describe the issues and the causal linkages between them explicitly and in detail, both to help choose the relevant indicators, and to help explain to the intended users how current processes interact in reality.

Modeling the key issues to obtain a conceptual understanding of the whole complex system with its social, economic, environmental and institutional components took place in the form of chains of circular feedback loops based on the "Systems Thinking" approach as shown in Figure (7-1).

Issues are highlighted in terms of their thematic classification (the five themes) to indicate the interrelationships between the various system components. To be able to read the model, an explanation of the distinguishing features of the model is illustrated in Table (7-3).
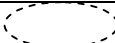
Feature	*Description*
⬭	Main issues identified by different stakeholders
(⬭ dashed)	Sub issues or components of the main issues
→⁺	A causal link between two variables where a change in one variable causes a proportional change in the other one
→⁻	A causal link between two variables where a change in one variable causes an inverse change in the other one
- - -	A descriptive link between two variables where one variable describes the other or where one is a subcomponent of the other

Table (7-3): Description of key features of the "Egyptian Rural System Model"
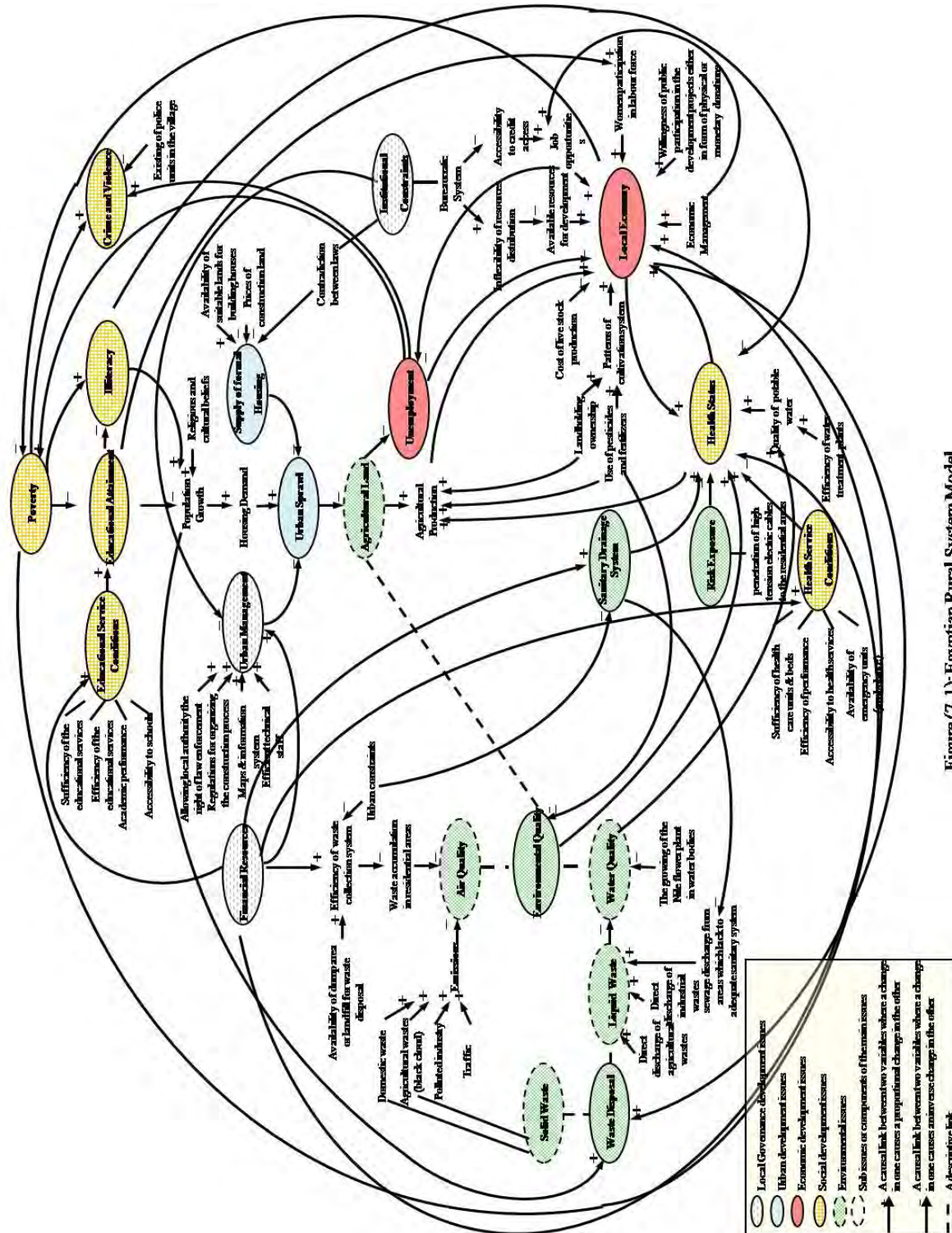
Figure (7-1): Egyptian Rural System Model

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It ought to be noted that while modeling the linkages between the key issues and identifying the interrelationships between the various factors of influence in the Egyptian village system model, one of the main concerns was not to impose any kind of categorization on the issues or to attempt to divide them into specific groups. This is carried out neither in terms of environmental, economic, social and institutional, nor in terms of the five main development themes of the conducted questionnaire. The main aim of modeling the issues in this manner is to understand how in reality these issues interrelate to each other. For this reason, examining the issues together rather than in isolation was a key to understand and explain the interrelationships between the rural system components.

It can be clearly noticed in the model that for example the main issues under the environmental theme are due to the issues of the urban development and local governance development themes. For example, agricultural land as a component of the environmental quality issue under the environment theme is directly influenced by urban sprawl, which is an issue under the urban development theme, which in turn is directly influenced by the urban management issue under the local governance theme and so on. To be able to identify the leverage points for change, it is essential to view the whole picture of the system rather than isolated parts.

7.6 The Comprehensive SIs set

The rationale behind elaborating the three different indicators sets; the comprehensive, the core and the provisional sets, is broadly explained in the methodology chapter, section 6.3. The comprehensive set of SIs covers all the system components, which have a function as a candidate set from which the core set of SIs will be selected. It ought to be noted here that while establishing the comprehensive set of SIs, indicators are organized under the five main development themes of the conducted questionnaire to assure comprehensibility and guarantee that none of the system components are missed. Candidate SIs are explained below a number of headlines as shown in Table (7-4). They are identified to represent every component in the rural system model as shown in Table (7-5). Some of these indicators are selected from the available ready-

made sets of SIs such as the UN-CSD set and the US-SDI set, while others are developed by the researcher particularly to tackle issues within the Egyptian village context as indicated under the description of the "Source of Indicator" headline in Table (7-5).

Headline	Explanation
Theme	The five crosscutting themes which represent the development sectors
Key Issues	Main issues identified by the various stakeholders
Candidate Indicators	Representative indicators to address the key issues of concern
Variable	The constructed measure of the candidate indicator
Unit	Unit of measurement
Data Source	Method of indicator's measurement
Type of indicator	Based on the defined types of SIs in sector 2.2.4, the candidate indicators vary between the first two types: 1. Quantitative SIs based on counts, mass, lengths, volumes, densities, OR 2. Quantitative SIs based on the scoring or ranking of essentially qualitative information Within the context of Table (7-5), the 2 types will be defined as Quantitative 1 & Quantitative 2
Trend of indicator	To indicate the direction of indicator in terms of compliance with sustainability; increase (the more the better) or decrease (the less the better)
Type of linkage	The link between the indicator and the issue that it represents; causal, contingent, statistical or component as explained earlier in section 2.2.3.
Source of indicator	Ready developed or developed by the researcher
Data availability	To indicate whether data or measurement of an indicator is available or not
Relevance to sustainability goals & objectives	Relation between the indicator and the main sustainability goal and objective that it should assess progress towards

Table (7-4): Explanation of the headlines describing the Comprehensive set of SIs

The following list includes the abbreviations contained in Table (7-5).

Av.	Available
CAPMAS	Central Agency for Public Mobilization & Statistics
Comp.	Component
Cont.	Contingent
EEAA	Egyptian Environmental Affairs Agency
EHDR	Egypt Human Development Report
MOHP	Ministry of Health and Population
MOLD	Ministry of Local Development
N.A.	Not Available
ORDEV	Organization of Reconstruction and Development of the Egyptian Village
Quan.	Quantitative
Res.	Researcher
R.D.	Ready Developed
Statis	Statistical
VSDP	Village Strategic Development Plan

Table (7-5): Description of the comprehensive set of SIs

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However, as can be noticed in Table (7-5), the total number of candidate indicators reached about 70 indicators. From a decision-maker's point of view, such the vast number of indicators is not desirable. Although it captures all the important aspects of sustainable development thoroughly, it would be difficult to deal with this vast number if rapid assessment or a comparison between villages is required. Therefore, there is a need to develop a core set of SIs, which has a limited number of key representative indicators and can reduce the volume of information to a workable level for decision-makers.

7.7 The Core SIs set

Selecting key representative indicators from the comprehensive set of indicators is not an easy task. The Egyptian rural system model plays a crucial role in this phase. Referring to the complex chains of circular feedback loops assists identifying the significant areas, which can provide a holistic vision about the village performance. The model is revised and areas which are represented by the HDI as shown in Figure (7-2) are highlighted to identify gaps, which need to be considered while developing the core set of SIs.

A close look at Figure (7-2) confirms the basic assumptions of this research in terms of the weakness of the HDI in capturing the environmental and institutional dimensions. It can be clearly recognized that the four HDIs *only* represent the local economic issue under the economic development theme alongside with the health status, educational attainment and illiteracy under the social development theme.

These issues are inevitably of considerable importance, but within the Egyptian village context in particular there are crucial issues, identified by the various stakeholders, which still need to be tackled such as environmental quality and waste disposal issues along with their sub-issues. Neglecting these issues while carrying out any assessment exercise would mask reality and provide misleading results.

To select a set of key representative indicators from the comprehensive set of indicators, the following criteria are taken into consideration:

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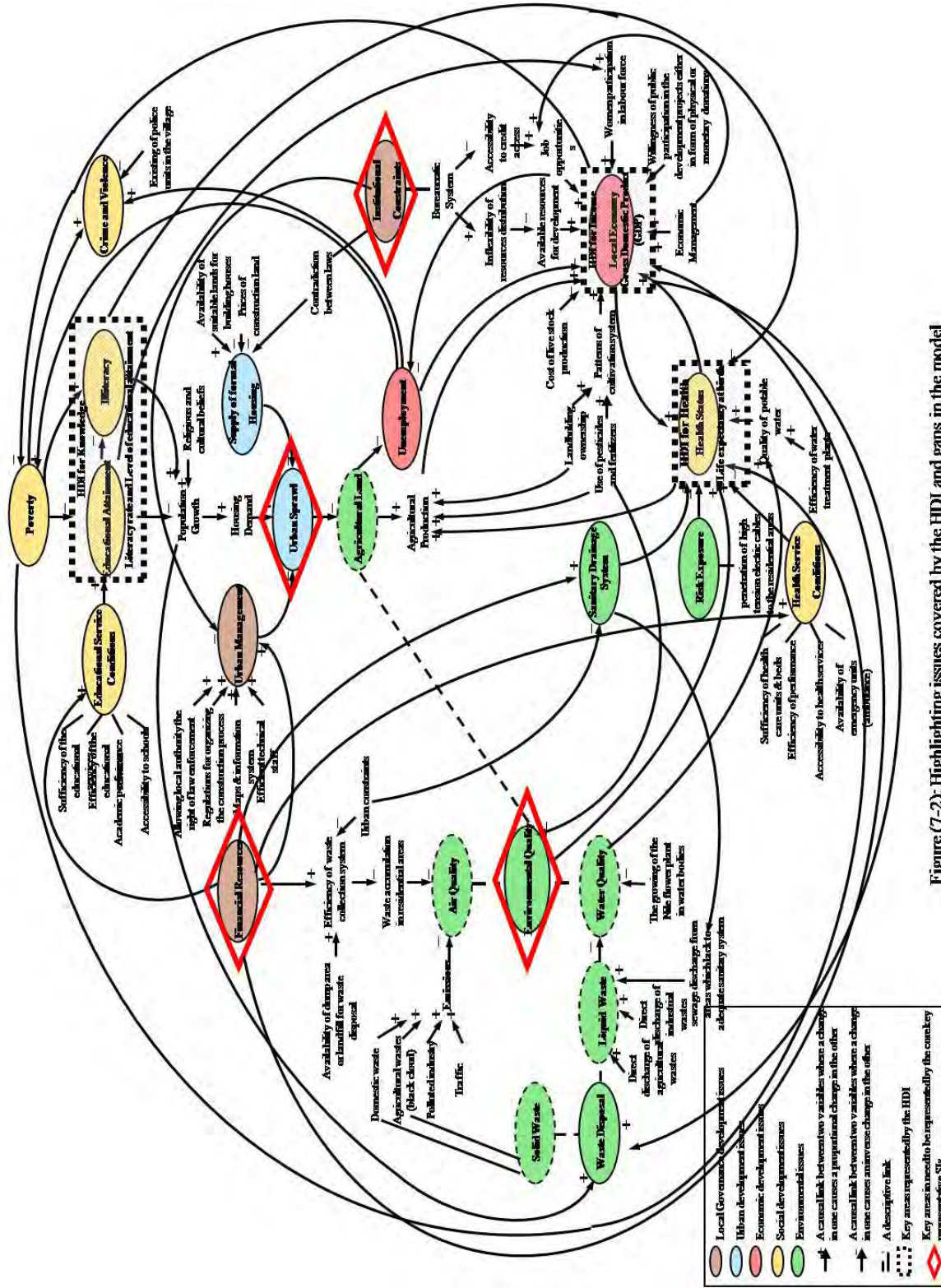
Figure (7-2): Highlighting issues covered by the HDI and gaps in the model

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- Each representative indicator is related strongly to sustainability goals and objectives and has considerable linkage to other issues within the model.
- The representative indicators should include the five main themes, not necessarily equal number of indicators below each theme, but as much as possible the significant issues below each theme.
- The representative indicators are practically measurable. Data availability is not an essential condition at this step.

Based on these criteria, a number of key representative indicators are selected as shown in Table (7-6) to provide a core set of SIs. The highlighted indicators in yellow indicate the four indicators composing the HDI.

Theme	Key Representative Indicators	Data Availability
Local Governance Development	Local authority empowerment (Yes/No)	Available
	Flexibility over resources distribution (Yes/No)	Available
	Sufficiency of financial resources (L.E./capita)	Not available
Urban Development	Annual urban growth rate in the period from 1985-2002 (%)	Available
Economic Development	Unemployment rate (15+) (%)	Available
	Real GDP per capita (ppp$)	Available
	Women in labor force (%)	Available
Social Development	Annual population growth rate 1996 – 2001 (%)	Available
	Life expectancy at birth (years)	Available
	Beds per 10000 people (Beds)	Available
	Adult literacy rate (15+) (%)	Available
	Combined 1st, 2nd & 3rd level gross enrolment ratio (%)	Available
	Annual loss of agricultural land (feddan)	Available

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The Environment	Population connected to sanitary drainage network (%)	Available
	Quality of potable water (Yes/No)	Not available
	BOD in water bodies (mg/l)	Not available
	Ambient concentration of air pollutants (% of days when standards/guidelines values are exceeded)	Not available

Table (7-6): The core SIs set of the Egyptian village.

7.8 The Provisional SIs set

As can be noticed in Table (7-6), 4 out of 17 indicators cannot currently be used to indicate village's performance due to a lack of data. Although these selected indicators are the most appropriate ones from the researcher's point of view, but to be able to get values, measure performance and practically examine the effect of an integrative set of SIs in providing a holistic vision about the current status, data availability is essential at this step.

The comprehensive set of SIs as well as the rural system model is revisited to find out substitute indicators, for which data are available and which have a strong linkage with the original indicators that lack data. From now on, the substitute SIs set will be called the provisional SIs set. It has to keep in mind that the provisional SIs set is for the purpose of obtaining values and results within this research context only, but if an assessment exercise is to carried out in reality, the core SIs set should be measured in order to provide as much as possible accurate and reliable results. The provisional SIs set is as shown in Table (7-7).

As can be noticed in Table (7-7), three indicators are replaced with others that have data and one is excluded. The replaced three indicators are as follows:

Theme	Key Representative Indicators	Data Availability
Local Governance Development	Local authority empowerment (Yes/No)	Available
	Flexibility over resources distribution (Yes/No)	Available
	Size of local revenues (L.E./capita)	Available
Urban Development	Annual urban growth rate in the period from 1985-2002 (%)	Available
Economic Development	Unemployment rate (15+) (%)	Available
	Real GDP per capita (ppp$)	Available
	Women in labor force (%)	Available
Social Development	Annual Population growth rates 1996 - 2001(%)	Available
	Life expectancy at birth (years)	Available
	Beds per 10000 people (Beds)	Available
	Adult literacy rate (15+) (%)	Available
	Combined 1st, 2nd &3rd level gross enrolment ratio (%)	Available
The Environment	Annual loss of agricultural land (feddan)	Available
	Population connected to sanitary drainage network (%)	Available
	Population connected to water network (%)	Available
	Presence of sources of air pollution (scale from 1- 4)	Available

Table (7-7): The Provisional SIs set

- Under the local governance development theme, the size of local revenues replaced the sufficiency of financial resources. It indicates the size of local revenue of each village based on the following resources; the urgent plan, the Shorouk programme, cleaning and other service revenues. Although it does not indicate the sufficiency of the village's resources to meet its own needs, but it can provide an indication about

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the local authority's ability to mobilize resources in order to increase its own financial resources. The greater the increase in these revenues, the greater ability of the local authority to meet the village's needs and requirements.

- Under the environment theme, the percentage of the population connected to the water network replaced the quality of potable water. It indicates the percentage of population who are getting drinking water from piped networks. This source of potable water should be monitored and the end product should be within the limits of the national standards for drinking water. It does not provide an accurate indication about the quality of drinking water, as it does not necessarily show that drinking water in networks is better than, for example the one obtained from pumps. In some cases it is not within the limits of standards and can be polluted as well. However, the probability of getting healthy and clean drinking water from water networks is much higher than the other sources. Therefore, this figure will be referred to instead of the quality of drinking water due to the unavailability of the latter.

- Under the environment theme, the presence of sources of air pollution replaced the ambient concentration of air pollutants. Sources of air pollution within village's context can be divided into four main sources as explained in the rural system model; domestic waste, agricultural waste, pollution from industry and traffic. There is no available data or measurements to indicate the concentration of pollution resulting from each source. Thus, the presence of each source will get a score of one. The best value has score zero and the worst has a score of four. All villages certainly have domestic waste. As for agricultural waste, it is considered that only villages that cultivate rice, as burning its waste is the main source of pollution, will get a score of one. With regard to pollution from industry, it is considered that only villages that have brick factories will score, as its emissions are the main source of industrial pollution. These will get a score of one unless other types of industries are stated in the village's report as polluting industries. Regarding traffic, the location of roads or railways in relative to the physical mass of the village will be considered as the indicator that replaces traffic emissions. If the roadway or railway penetrates or attaches the physical mass, it will get a score of one. Otherwise, it will

get a score of zero. The sum of the four sources will provide a picture of air pollution in the village.

With regard to the excluded indicator; BOD in water bodies, it indicates by how much water bodies are polluted. Alternatively, it is referred to as the main sources of water pollution. As explained in the model, there are three main sources; agricultural waste, industrial waste and direct discharge of untreated sewage, which are considered to be the main source of pollution. As mentioned earlier, there is no available data for any of these sources. Therefore, the other alternative is to search for the presence of these sources in the village. This is already covered by other indicators such as population connected to sanitary drainage network. The greater proportion of the population connected to sanitary drainage, the less discharge of untreated sewage in water bodies and the better the water quality. With regard to agricultural and industrial waste, their presence is already covered as sources of pollution in measuring air quality. For these reasons, it is decided to exclude the indicator of BOD in water bodies in the provisional SIs set and to keep it only in the core set of indicators.

The provisional SIs set should be measurable and applicable to any village of Lower Egypt governorates. The next chapter examines the applicability of the provisional SIs set by using it in assessing the sustainability of a group of villages and analyzing the results to indicate their current performance.

7.9 Conclusion

Based on the concept of "Systems Thinking", a model that envisages the current processes for a typical Egyptian village is established. This model aims at describing the key issues identified by different stakeholders and addressing the causal linkages between them explicitly and in detail, both to help choose the relevant indicators, and to help explain to the intended users how current processes interact in reality.

This model is considered the bedrock to develop a set of SIs appropriate to Egyptian village context. Three sets of SIs are developed consecutively; the comprehensive set, the core set and the provisional set. Each set is established to fulfill a certain purpose.

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Firstly, the *comprehensive* set of SIs aims at providing decision-makers with a comprehensive vision about the current status of a particular village. It covers all the system components thoroughly, which have a function as a candidate set from which the core set of SIs will be selected. However, the vast number of indicators contained in the comprehensive set is usually perceived by decision-makers as undesirable, which might limit its usefulness. Therefore, the need to have a core set of SIs arose, which has a limited number of key representative indicators and can reduce the volume of information to a workable level for decision-makers.

Secondly, the *core* set of SIs is selected from the comprehensive set of indicators in order to highlight issues with crucial importance, which should be considered important policy priorities. Establishing the core set is built upon the HDI due to its widely well known technique as an assessment tool. Building on existing indicators which feed into HDI is believed to be more acceptable, because it would not require changing the way HDI data are currently collected. In order to practically examine the applicability of the core set of SIs, data availability is considered an obstacle. Therefore, the need to develop substitute indicators with data availability to replace the indicators lacking data in the core set arose. This is resulted in a new set of SIs, which called the provisional SIs set.

Thirdly, the *provisional* SIs is established for the purpose of obtaining values and results within this research context only, but if an assessment exercise is carried out in reality, the core SIs set should be measured in order to provide as much as possible accurate and reliable results.

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Chapter (8): Examining the Adopted Process

Introduction

This chapter examines the credibility and applicability of the adopted process for developing a core set of SIs (i.e. the provisional set within this research context). It aims at investigating the impact of using an integrative set of SIs in providing a holistic vision about development trends in a particular village instead of using only social and economic indicators, which are composing the HDI. It comprises two parts. The first part includes a description of the selected test sample of villages to examine the applicability of the provisional core set of SIs, while the second one explains two different approaches to assess the performance of the test sample villages based on their indicator states. Following this, a graphical presentation of the results took place to make their interpretation easier, then analysis of findings. The advantages and disadvantages of each approach are clarified to indicate their usefulness for policy and decision making.

8.1 Selection of test sample villages

To be able to measure indicators and get values in order to indicate the village's performance on the path of sustainable development, a test sample is selected. As mentioned at the outset of this research, this SIs set is particularly developed for Lower Egypt villages. Consequently, the test sample is selected to represent Lower Egypt Villages based on a number of criteria. A justification of the selected test sample is illustrated in detail in the methodology chapter, section 6.5. This part includes a brief description of the test sample villages to provide a general overview about their characteristics.

8.1.1 Description of the test sample

The test sample encompasses the eight mother villages of Markaz Shebein Elkanater – Qalyobia Governorate as shown in Figure (8-1).

Lower Egypt Governorates	
Qalyobia Governorate	
Markaz Shebein El Kanater	Boundaries of the administrative units of the test sample villages & the city of Markaz Shebein El Kanater
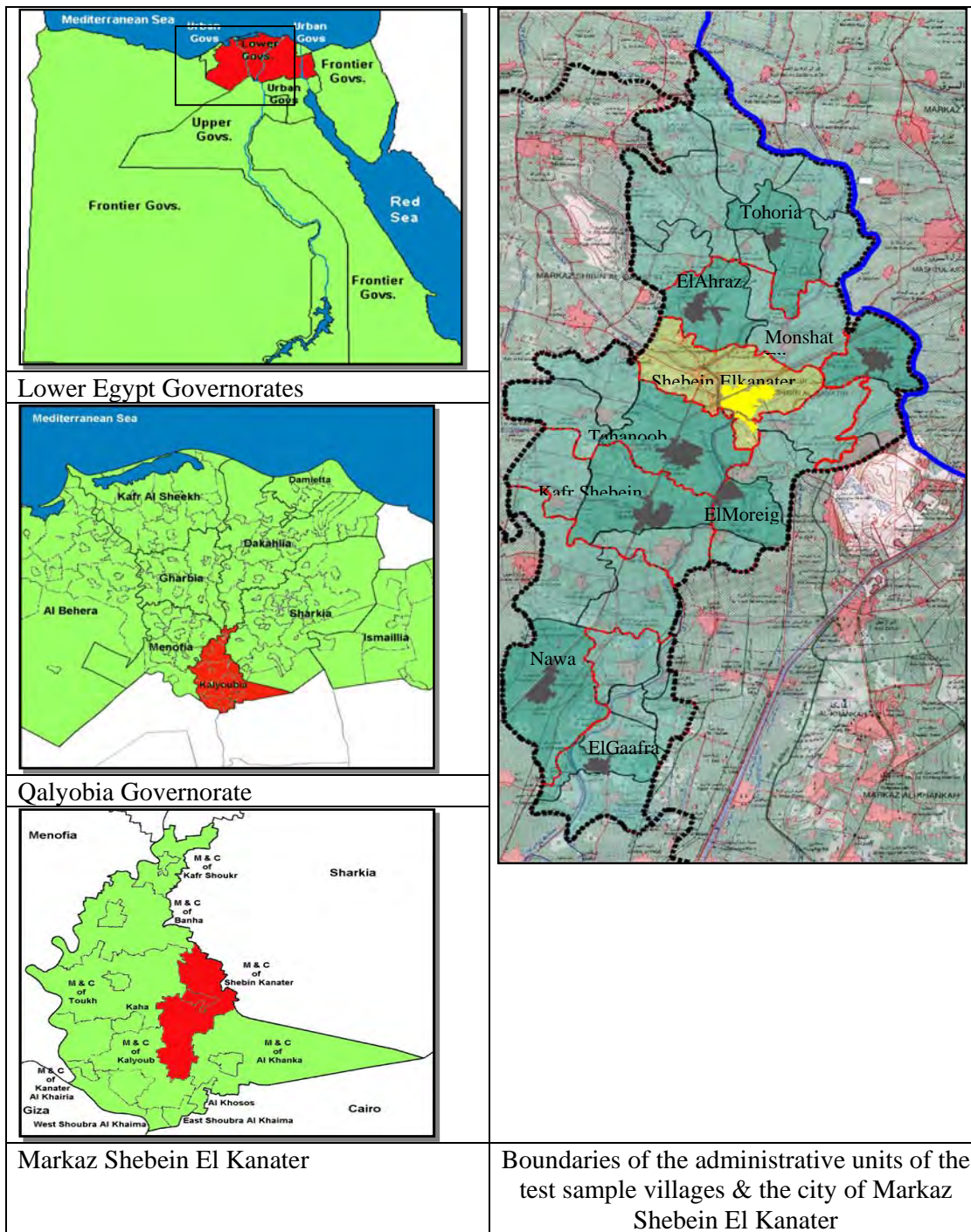
Figure (8-1): Location of the test sample villages

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8.1.1.1 Qalyobia Governorate

Qalyobia is located east of the Rosetta branch of the Nile at the head of the Delta. It is bounded on the north by the Dakahelya governorate, on the east and northeast by the Sharqia governorate, on the southeast by Cairo, on the west by Menoufia and Gharbia governorates, and on the southwest by Giza. Qalyobia governorate contains seven ("markaz"), nine cities, two boroughs and 46 main villages, with 195 satellite villages and 901 hamlets ("ezbah" and "kafr").

The important distinctions of Qalyobia governorate can be summarized as illustrated in Qalyobia Human Development Report (UNDP, ORDEV et al.2003) as follows:

1. The total area of Qalyobia is 1124 square kilometres. The urban establishments comprise 15.6 % of the total Qalyobia land area, the cultivated land inside and outside the registry boundary (Elzemam) comprise 79.7 %, the desert land comprises 4.7 % and ponds and fellow lands comprise 0.1 % (ElWakil 2003b).

2. Urban encroachment on agricultural land reached 9412.3 feddan in the period from 1999-2002, i.e. 3137.4 feddan annually, which is one of the highest rates at the national level (ElWakil 2003b).

3. The total population of the governorate is about 3.62 million inhabitants (2001 statistics). This represents about 5.36 % of Egypt's total population, with an average population growth rate of 2.1 in the period from 1996-2002 (UNDP, ORDEV et al.2003).

4. The total cultivated land area is 188.4 thousand feddan comprises 2.69% of total cultivated lands in Egypt (F.Hassan 2003b), with a varied agricultural production in field crops, horticultural products, as well as animal and poultry products. The soil of the Qalyobia governorate is considered to be one of the most fertile in the country. Of the total cultivable area in the governorate, first-grade agricultural lands amount to 81.8%, whereas second-grade agricultural lands constitute only 18.2%. The governorate is a major source of the agricultural and food needs of the inhabitants of the greater Cairo metropolis (UNDP, ORDEV et al.2003).

5. It is one of the important industrial giants at the national level in Egypt, in terms of the variety of its industrial portfolio, productivity, labour force employment capability, and

contribution to total industrial productivity (UNDP, ORDEV et al.2003).

6. It provides the main transportation access link by roadways, railways and river transport that link the governorates of the delta to the southern governorates in Upper Egypt (UNDP, ORDEV et al.2003).

8.1.1.2 Markaz Shebein ElKanater

Markaz Shebein Elkanater is one of seven Markazes included in Qalyobia governorate. It is located in the eastern part of the governorate. It is bounded on the north by the Sharqia governorate and Markaz Banha, on the east by the Sharqia governorate and Markaz Al Khanka, on the west by Markaz Touhk and Mrkaz Qalyoub and on the south by Markaz Qalyoub.

It is divided administratively into the Markaz and the city of Shebein Al Kanater, 8 main (mother) villages, 36 satellite villages and 136 Ezbah and Kafr as shown in Figure (8-2).

The important distinctions of Markaz Shebein Elkanater can be summarized as illustrated in the Instructional Physical Plan reports of test sample villages (B. Khairi et al. 2003; Elhouseni 2003; Khairi 2003; M.Khorazati 2003; ElWakil 2003a; F.Hassan 2003a; ElWakil 2003b; F.Hassan 2003b) as follows:

1. The total land area of Markaz Shebein Elkanater is 142 square kilometres, comprising about 12.63 % of the total area of Qalyobia. The cultivated land comprises 86.8 % of Markaz Shebein Elkanater total land area.

2. The total population of Markaz Shebein Elkanater is 338628 inhabitants (1996 statistics). This represents about 9.3 % of Qalyobia's total population, where rural inhabitants versus urban inhabitants represent 85.72% and 14.28 % respectively. The distribution of population over the local units of Markaz Shebein Elkanater is shown in Table (8-1).

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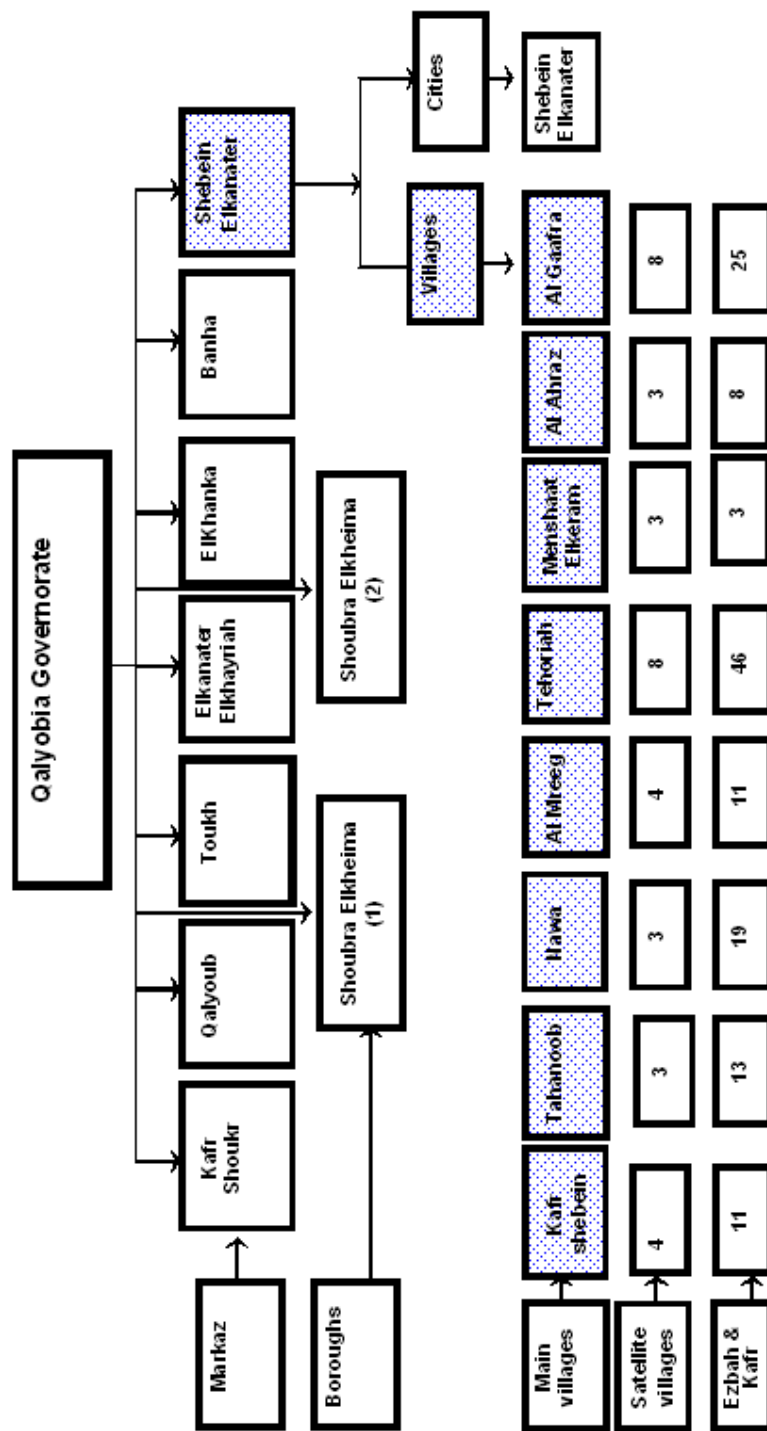
Figure (8-2): Test sample villages in relative to the administrative hierarchy of Qalyobia governorate

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	Urban	Rural									Total of rural Shebein Elkanater	Total of Markaz Shebein Elkanater
	Shebein Elkanater City	Kafr Shebeen	Tahanoob	Nawa	Al Mreeg	Tehoriah	Menshaat Al keram	Al Ahraz	Al Gaafra		
Pop.	48372	46547	41212	35810	32990	31406	30335	26749	45207	290256	338628
%	14.28	13.75	12.17	10.58	9.74	9.27	8.96	7.90	13.35	85.72	100

Table (8-1): Population distribution over the local units of Markaz Shebein Elkanater

3. The main economic investment in Markaz Shebein Elkanater is in the agricultural sector. The distribution of population over economic activities indicates that 26.9%, 18.9% and 54.2% are working in agricultural activities, industrial activities and service activities respectively. This means that the majority of population work outside the markaz in other markazes within the governorate or outside the governorate, which demands an efficient transportation network to fulfil the commuting needs.

4. It has a high rate of unemployment: 11.8% of the total population in the labour force at the level of Markaz Shebein ElKanater and 9.1% at the level of Qalyobia governorate.

5. It has a high rate of illiteracy, at levels of 40 % of the total population in the educational age at the level of Markaz Shebein ElKanater and 35.4 % at the level of Qalyobia governorate.

6. Markaz Shebein Elkanater is connected with the regional road network by a significant number of roadways and railways as follows:

   - Cairo – Alexandria Agricultural Road: this is one of the most significant regional roads in Egypt, which connects Cairo with many cities in the Delta. The average daily traffic volume reaches about 75,000 vehicles/day.
   - The Grater Cairo Ring Road: the ring road surrounds Greater Cairo Region (GCR). Its length is about 100 Kilometers, with average daily traffic volume about 50,000 vehicles/day. Moreover, it connects the new urban communities such as the 6th of October, ElSheikh Zaied, El-Obour, El-Shorouk and new Cairo with GCR.

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- Qalyoub – Shebein El Kanater – Belbeis Road: this connects Markaz Shebein Elkanater with some parts of the Qalyobia and Sharqya governorates. The average daily traffic volume varies between 15,000-20,000 vehicles/day.
- Shebein ElKanater – Toukh Road: this connects Markaz Shebein Elkanater with Markaz Toukh. Moreover, it is considered a link of the Cairo – Alexandria Road that connects the markaz with Banha city. The average daily traffic volume varies between 10000-12000 vehicles/day.
- Belbeis Agricultural Road: this connects Markaz Shebein Elkanater with the north of GCR and extends to Belbeis and Ismailia. The average daily traffic volume is about 30,000 vehicles/day
- Cairo – Alexandria Railway: this is one of the most significant railways in Egypt, which connects Markaz Shebein Elkanater with the north of GCR and the many cities and governorates in the Delta.
- Qalyoub – Shebein El Kanater – Belbeis – Elzaqazeiq – Al Mansoura: this is the direct link which connects the Markaz with Cairo, El-Sharqya and Al Mansoura.

7. The main source of drinking water for all the villages in Markaz Shebein Elkanater is groundwater in addition to some surface water stations. Pumping stations are equipped with deep pumps to extract water from water-bearing layers at different depths, which vary according to the location of each well. Pumping stations are equipped with devices for water purification but no water purification or treatment stations are provided. The total number of wells reached 28 all over the markaz.

8. All the villages of Markaz Shebein Elkanter are deprived of adequate sanitary drainage systems, although at the level of the governorate the service has reached some markazes such as Banha and Kafr Shokr. Citizens usually establish trenches without sealed floors for sewage disposal. Thus, it reaches the groundwater near the earth's surface, causes pollution of groundwater and over time leads to a rise in its level and increases the likelihood of contamination of drinking water sources. Moreover, citizens usually dispose of sediment accumulated within these trenches on both sides of the canals and

sewers, which is a violation of environmental laws and causes serious pollution to the surrounding environment.

9. Domestic waste is usually collected by the local units through the cleanliness project three times a week. The percentage of citizens subscribing to the service varies between 30%-70% in the test sample villages, while the rest get rid of garbage by throwing it into streets or alongside canals and sewers. The collection company transfers collected waste to the public dump area in Abo Zaabal, which receives loads exceeding its capacity. Waste is then burnt, which leads to serious air pollution causing environmental damage, as it is not equipped with a factory for waste recycling or fertilizer manufacture.

10. As for physical characteristics, the physical shapes of test sample villages are shown in Figure (8-3). It indicates the physical mass inside the physical demarcation of 1985, which represents the registry area and the village's expansion outside it, which represents the urban encroachment onto agricultural land. Table (8-2) provides data concerning the physical characteristics of the test sample villages. The urban fabric is similar to other Egyptian villages. It can apparently recognize the irregular traditional pattern inside the boundary of the old village (Daier El-Nahyah) and the regular linear pattern in expansion areas. It also indicates the location of the physical mass in relation to the roadways and railways if this exists.

Village	Area inside the physical demarcation of (1985) (feddan)	Total land area (2003) (feddan)	Urban encroachment outside the physical demarcation of (1985)	Population (000s) 2001
Kafr Shebeen	143	255	78%	27.6
Tahanoob	135	204	51%	19.3
Nawa	86	186	116%	23.3
Al Mreeg	60	95	58%	10.5
Tehoriah	28	65	132%	5.9
Menshaat Al keram	60	104	73%	12.8
Al Ahraz	59	132	124%	13.9
Al Gaafra	33	88	167%	8.5

Table (8-2): Some characteristics of the test sample villages

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Kafr Shebein	Tahanoob
Tehoriah	Menshaat El Keram
Nawa	Al Mreeg
Al Ahraz	Al Gaafgra
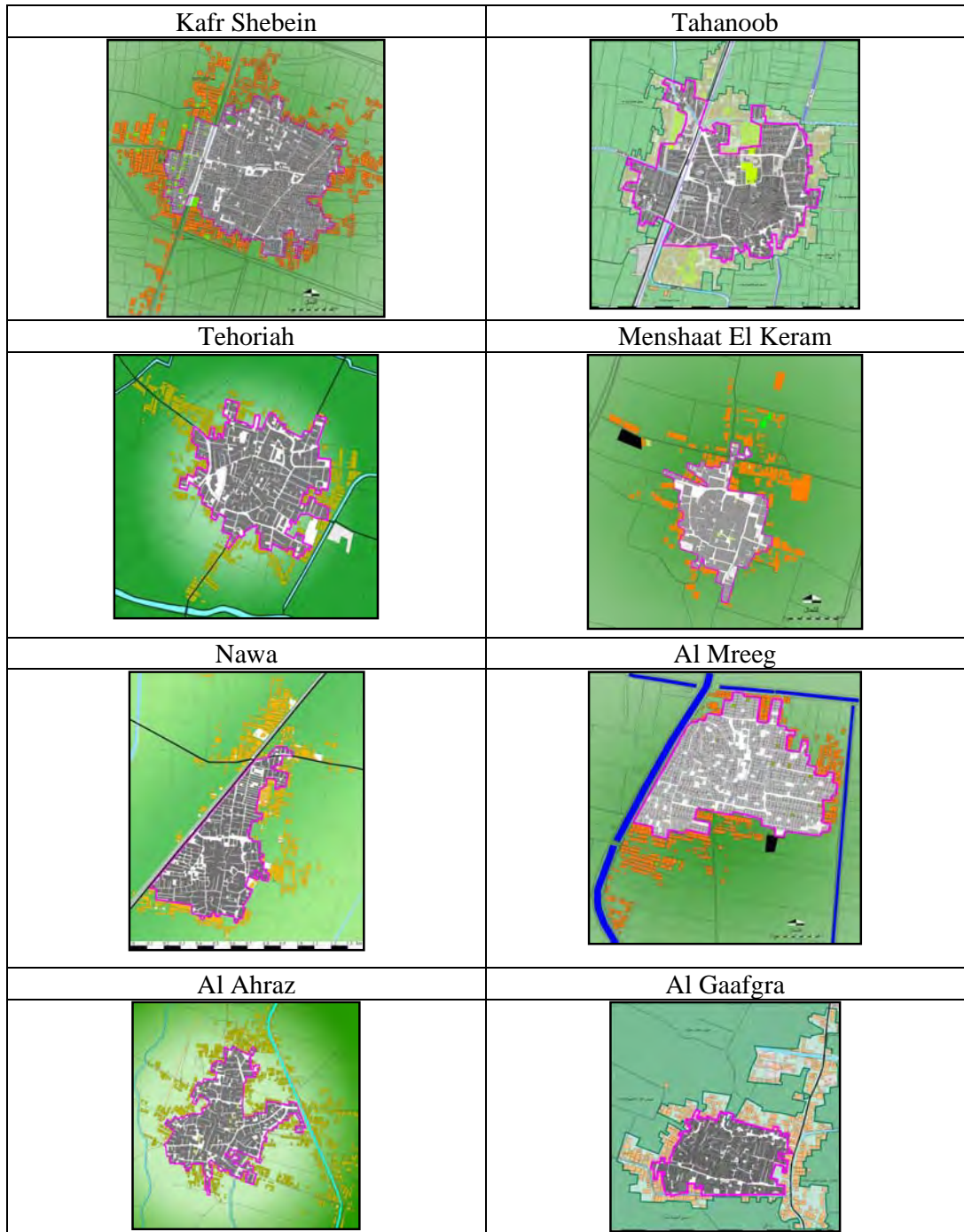
Figure (8-3): Contents of the test sample villages

8.2 Assessing village performance

By using the provisional set of SIs to assess each village's performance, the current state of the test sample villages is presented in Table (8-3). Values for the presence of sources of air pollution indicator are calculated as shown in Table (8-4). It has been taken into consideration while obtaining the values of indicators to refer to more than one source within data available to assure accuracy and reliability.

However, accuracy could not be guaranteed for all of them. Specifically, the indicator of the size of local revenues, there was no consistency amongst the available data. Some sources of the local revenues were missing in some villages. Moreover, there were no data for Al-Mreeg and Tehoriah. Values of the two villages are based on the average of the other six villages.

Theme	Indicator / Village	Shebeen	Tahanoob	Nawa	AlMreeg	Tenonan	Alikeram		
Local Governance Development	Local authority empowerment (Yes/No)	No	No	No	No	No	No	No	No
	Flexibility over resources distribution (Yes/No)	No	No	No	No	No	No	No	No
	Size of local revenues (L.E./capita)	2884	5958	3416	4828	4828	7867	4576	4266
Urban Development	Urban growth rate (%)	4.6	3.0	6.8	3.4	7.8	4.3	7.3	9.8
Economic Development	Unemployment rate (%)	9.2	11.1	4.8	11	8.8	13.9	7.8	5.9
	Real GDP per capita (ppp$)	2643.9	2594.5	3275.8	2444.2	2872.7	2397	2570.5	2286.9
	Women in labor force (%)	16.6	20.2	7.3	7.4	19.2	7.6	9.6	5.5
	Population growth rate (%)	1.125	1.115	1.107	1.103	1.158	1.106	1.153	1.113
	Life expectancy at birth (Yerars)	67.8	67.3	67	67.1	68.1	67.2	67.2	67.8
Social Development	Beds per 10000 people (Beds)	20.9	21	23.3	19.9	23.5	24.4	26.1	20.9
	Adult literacy rate (%)	74.8	72.4	65.2	71.7	61.3	59.7	54.3	47.8
	Combined 1st, 2nd &3rd level gross enrolment ratio (%)	71	71.2	71	71.5	71.3	71	70.9	71.5
The Environment	Annual loss of agricultural land	6.6	4.1	5.9	2.1	2.2	2.6	4.3	3.2
	Population connected to sanitary drainage network (%)	0	0	0	0	0	0	0	0
	Population connected to water network (%)	90	88.2	64.8	71.9	74.7	80	71.5	56.5
	Presence of sources of air pollution (scale from 1-4)	3	3	3	1	2	1	2	2

Table (8-3): Current state of the test sample villages according to values of the provisional set of SIs

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Table (8-3): Current state of the test sample villages according to values
of the provisional set of SIs

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Village	Domestic waste	Agricultural waste	Polluted industry	Traffic	Total
Kafr Shebeen	1	1	-	1	3
Tahanoob	1	1	-	1	3
Nawa	1	1	-	1	3
Al Mreeg	1	-	-	-	1
Tehoriah	1	1	-	-	2
Menshaat Al keram	1	-	-	-	1
Al Ahraz	1	-	-	1	2
Al Gaafra	1	-	-	1	2

Table (8-4): Calculations of value of the presence of sources of air pollution indicator

Two different approaches are employed in this research to assess village performance based on indicator states as explained in the methodology chapter, section 6.4:

1. The first approach aims at ranking villages based on indicator states by aggregating these individual indicators into *one composite indicator*; a Sustainable Development Index (SDI). The adopted mathematical technique is called "The distance from the best and worst overall performers".

2. The second approach aims at assessing village performance based on indicator states according to the values of *individual indicators*. The adopted mathematical technique is called "The Distance from the Leader Value". The *"Leader Value"* is defined here by choosing the best value reached in any single indicator within the test sample villages. In this technique, a baseline or a benchmark should be established for every individual indicator in order to assess current performance and monitor progress over time.

The advantages and disadvantages of both of them are clarified in the following section.

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8.2.1 The first approach: ranking villages based on the value of a composite indicator

The employed mathematical technique for constructing a single composite indicator; the SDI is "The distance from the best and worst overall performers". A full explanation of the technical procedure needed for its construction is described in section 3.2.7.2. In this technique the typical composite indicator, I is built as follows:

$$I = \sum_{i=1}^{N} w_i x_i,$$ (1)

Where x_i is a normalized variable and w_i a weight attached to x_i, with $\sum_{i=1}^{N} w_i = 1$ and $0 \leq w_i \leq 1$, $i = 1, 2, \ldots, N$.

For fulfilling the two main technical steps required for its construction, which are:

- Standardization of the variables to allow comparison
- Weighted summation of these variables

Standardization of variables is carried out using the following equation:

$$100 \left(\frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}} \right)$$ (2)

By applying equation (2) to the values contained in Table (8-3), the results are presented in Table (8-5). As for weights, all the indicators are considered to have the same importance to alleviate the trade-off amongst the different issues.

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Theme	Indicator	Kafr Shebeen	Tahanoob	Nawa	Al Mrieg	Tchorian	Mentshaat Al Keram	Al Arnaz	Al Gaafra
Local governance development	Local authority empowerment (Yes/No)	0	0	0	0	0	0	0	0
	Flexibility over resources distribution (Yes/No)	0	0	0	0	0	0	0	0
Urban development	Size of local revenues (L.E./capita)	0.0	61.7	10.7	39.0	39.0	100.0	34.0	27.7
	Urban growth rate (%)	23.5	0.0	56.4	6.3	70.1	19.2	62.8	100.0
Economic development	Unemployment rate (%)	48.4	69.2	0.0	68.1	44.0	100.0	33.0	12.1
	Real GDP per capita (ppp$)	36.1	31.1	100.0	15.9	59.2	11.1	28.7	0.0
	Women in labor force (%)	75.5	100.0	12.2	12.9	93.2	14.3	27.9	0.0
	Population growth rate (%)	40.0	21.8	7.3	0.0	100.0	5.5	90.9	18.2
Social development	Life expectancy at birth (Years)	72.7	27.3	0.0	9.1	100.0	18.2	18.2	72.7
	Beds per 10000 people (Beds)	16.1	17.7	54.8	0.0	58.1	72.6	100.0	16.1
	Adult literacy rate (%)	100.0	91.1	64.4	88.5	50.0	44.1	24.1	0.0
	Combined 1st, 2nd &3rd level gross enrolment ratio (%)	16.7	50.0	16.7	100.0	66.7	16.7	0.0	100.0
The Environment	Annual loss of agricultural land	100.0	44.2	84.4	0.0	2.6	11.7	49.4	26.0
	Population connected to sanitary drainage network (%)	0	0	0	0	0	0	0	0
	Population connected to water network (%)	100.0	94.6	24.8	46.0	54.3	70.1	44.8	0.0
	Presence of sources of air pollution	100.0	100.0	100.0	0.0	50.0	0.0	50.0	50.0

Table (8-5): Standardization of variables according to the "distance from the best and worst overall performers" technique

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As can be noticed in the provisional set of SIs, trends in the indicators which would show progress towards sustainable development vary. For some indicators maximization is positive (i.e. progress towards sustainable development), while for others the reverse is true as shown in Table (8-6).

Maximization is positive	*Minimization is positive*
Local authority empowerment (Yes/No)	Annual urban growth rate in the period from 1985-2002 (%)
Flexibility over resources distribution (Yes/No)	Annual Population growth rates 1996 - 2001(%)
Size of local revenues (L.E./capita)	Unemployment rate (15+) (%)
Real GDP per capita (ppp$)	Annual loss of agricultural land (feddan)
Women in labor force (%)	Presence of sources of air pollution (scale from 1- 4)
Life expectancy at birth (years)	
Beds per 10000 people (Beds)	
Adult literacy rate (15+) (%)	
Combined 1st, 2nd &3rd level gross enrolment ratio (%)	
Population connected to sanitary drainage network (%)	
Population connected to water network (%)	

Table (8-6): Trend of indicators

To be able to apply equation (1) it is thus necessary to transform the scores of these indicators by using the simple equation (100 – standardized indicator score).

By applying this transformation to the values contained in Table (8-4), the results presented in Table (8-7) are obtained. Then, by applying equation (1) to the values contained in Table (8-7), a SDI is constructed for each village and they can be ranked as shown in Table (8-8). Values of the HDI for these villages and their ranks amongst both Qalyobia villages and themselves are presented in Table (8-8) as well.

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Theme	Indicator village	Kafr Shebeen	Tahanoob	Nawa	Al Mreeg	Tenofah	Menshaat Al keram	Al Ahraz	Al Gaafra
Local Governance Development	Local authority empowerment (Yes/No)	0	0	0	0	0	0	0	0
	Flexibility over resources distribution (Yes/No)	0	0	0	0	0	0	0	0
Urban Development	Size of local revenues (L.E./capita)	0.0	61.7	10.7	39.0	39.0	100.0	34.0	27.7
	Urban growth rate (%)	76.5	100.0	43.6	93.8	29.9	80.8	37.2	0.0
Economic Development	Unemployment rate (%)	51.6	30.8	100.0	31.9	56.0	0.0	67.0	87.9
	Real GDP per capita (ppp$)	36.1	31.1	100.0	15.9	59.2	11.1	28.7	0.0
	Women in labor force (%)	75.5	100.0	12.2	12.9	93.2	14.3	27.9	0.0
Social Development	Population growth rate (%)	60.0	78.2	92.7	100.0	0.0	94.5	9.1	81.8
	Life expectancy at birth (Yerars)	72.7	27.3	0.0	9.1	100.0	18.2	18.2	72.7
	Beds per 10000 people (Beds)	16.1	17.7	54.8	0.0	58.1	72.6	100.0	16.1
	Adult literacy rate (%)	100.0	91.1	64.4	88.5	50.0	44.1	24.1	0.0
	Combined 1st, 2nd &3rd level gross enrolment ratio (%)	16.7	50.0	16.7	100.0	66.7	16.7	0.0	100.0
The Environment	Annual loss of agricultural land	0.0	55.8	15.6	100.0	97.4	88.3	50.6	74.0
	Population connected to sanitary drainage network (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Population connected to water network (%)	100.0	94.6	24.8	46.0	54.3	70.1	44.8	0.0
	Presence of sources of air pollution	0.0	0.0	0.0	100.0	50.0	100.0	50.0	50.0

Table (8-7): Normalized Impact Matrix According for Minimization Objectives

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Village	The SDI value	Rank according to the SDI	The HDI value	Rank according to the HDI amongst Qalyobia Gov.	Rank according to the HDI amongst test sample villages
Tehoriah	753.8	1	0.642	71	5
Tahanoob	738.3	2	0.656	30	2
Al Mreeg	737.0	3	0.651	42	4
Menshaat Al keram	710.7	4	0.623	112	6
Kafr Shebeen	605.2	5	0.665	17	1
Nawa	535.6	6	0.652	40	3
Al Gaafra	510.3	7	0.598	162	8
Al Ahraz	491.5	8	0.615	131	7

Table (8-8): A comparison between the HDI and the SDI ranks for test sample village

8.2.1.1 Analyzing Results

As can be noticed in Table (8-8), ranks according to the HDI values are completely different from the SDI ones. This confirms the basic assumptions of this research that integrating the environmental and institutional dimensions with the economic and social dimensions can yield to different results. Moreover, relying on the HDI exclusively misses the importance of the certain factors and can lead to misleading results. Thus, if a comparison between a numbers of villages based on the value of single composite indicator is required, then the SDI would definitely be of utility to policy and decision – makers.

However, there are a number of very significant disadvantages with this approach. These disadvantages concern both the idea of composing an index and the adopted mathematical technique to construct this index.

Firstly, the idea of composing a single composite indicator or an index (the SDI) can misrepresent the real situation and mask reality. It implies *compensability* among the different individual indicators i.e. the

possibility that a good score on one indicator can always compensate a very bad score on another indicator. Complete compensability implies that an excellent performance in the economic dimension can justify any type of a very poor performance for example in the environmental dimensions, *which is exactly what the concept of sustainability attempts to avoid*.

Moreover, aggregating all the indicators into one single value is of limited utility in capturing the real problems in each village. It might be helpful in sounding the alarm that for example El-Gaafra needs more attention than Tahanoob and encouraging policy makers to look more closely and investigate why there are problems here and not there. However, the role of the index should stop at this point. Disaggregation then is essential to identify the problems, their causes and how to deal with them.

Although devising additional indicators to complement the four indicators of the HDI result in different rankings, aggregating all the values into one single value (index) precludes the powerful role of indicators, particularly in defining priorities and altering perceptions.

Secondly, the adopted mathematical technique: the ranking method used to rank the test sample villages is the linear aggregation rule. In this case all the indicators are considered as having the same importance to alleviate the trade-off amongst the different issues i.e. no weighting coefficient is used. But, if weights were used as importance coefficients as for example the HDI[12], the final value would definitely change and consequently result in different rankings.

8.2.2 The second approach: assessing village performance based on the values of individual indicators

This technique is principally chosen to alleviate the disadvantages of aggregating the indicators into one composite indicator, as explained in the first technique. It indicates the village performance based on the

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[12] In the HDI, although its 3 sub indices have the same weight, the 2 indicators composing the educational index have different weights. The rate of literacy among adults 15+ is two-thirds and the combined 1st, 2nd &3rd level gross enrolment ratio (%) is one-third.

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values of individual indicators. Thus, it can be easily used for policy purposes. Its usefulness is principally for realizing the following objectives:

- To avoid the aggregation of all of the indicators in one single composite indicator or index. As can be seen in the first technique, this approach is not desirable because it does not give useful information on the behaviour of single indicators so that its policy usefulness is very limited.
- To avoid compensability, as explained in the first technique; the possibility that for example, good performance of the village's economy can always substitute for any environmental destruction that threatens its sustainability.
- To be as much transparent as possible to local people when identifying development priorities. It is important to clarify when drawing up policy, why for example the environmental dimension requires more attention than the social dimension, and what factors exactly under each dimension are in need of immediate actions. This is the main purpose of developing this set of SIs; to provide a clear vision about a village's performance and to highlight areas which need attention from policy makers.

In this technique, a reference value or a benchmark should be established for every individual indicator in order to assess current performance and monitor progress over time. Generally speaking, for the majority of indicators not only within the context of this research but also in many exercises for developing SIs, no clear reference value is available. For example, when GDP is used, the ideal value of a country or region's GDP is not known, thus it is quite common to compare with other countries.

Within the context of this research, in order to get a set of reference values, a "leader value" is identified by choosing the best value reached in each single indicator within the test sample villages. This is a well established technique in multi-criteria evaluation literature (Zeleny 1982; Yu 1985) cited in (Munda 2005, p127).

Table (8-9) indicates the leader value in each individual indicator and the source of the value.

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Theme	Key Representative Indicators	Leader Value	Source of value
Local Governance Development	Size of local revenues (L.E./capita)	7867	Menshaat Al keram
Urban Development	Annual urban growth rate in the period from 1985-2002 (%)	3.0	Tahanoob
Economic Development	Unemployment rate (15+) (%)	4.8	Nawa
	Real GDP per capita (ppp$)	3275.8	Nawa
	Women in labor force (%)	20.2	Tahanoob
Social Development	Annual Population growth rates 1996 - 2001(%)	1.103	Al Mreeg
	Life expectancy at birth (years)	68.1	Tehoriah
	Beds per 10000 people (Beds)	26.1	Al Ahraz
	Adult literacy rate (15+) (%)	74.8	Kafr Shebein
	Combined 1st, 2nd &3rd level gross enrolment ratio (%)	71.5	Al Mreeg
The Environment	Annual loss of agricultural land (feddan)	2.1	Al Mreeg
	Population connected to sanitary drainage network (%)	0	–
	Population connected to water network (%)	90	Kafr Shebein
	Presence of sources of air pollution (scale from 1- 4)	1	Al Mreeg

Table (8-9): The leader value in each individual indicator and its source

For the first two indicators below the local governance development; local authority empowerment and flexibility over resources distribution, the value should be constant for all villages. They are related to central government policies and decisions. The local authority has nothing to do with this issue. If changes or improvements in central government policy take place, this will affect all the villages similarly. For this reason, these two indicators are excluded from Table (8-9) as well as from the graphical presentation of the results afterwards.

A detailed explanation of the adopted mathematical technique is illustrated in section 3.2.7.1. To establish sustainability benchmarking, two steps have to be carried out as follows:

1. Applying a normalization rule known as 'distance from the group leader' which assigns 100 to the leader village and other villages are ranked as percentage points away from the leader (Munda 2005, p128).
2. Considering the trend of each indicator, when the objective is minimization the leader is the village with the lowest indicator score and vice versa.

By applying these two steps to the indicator scores of the eight villages in Table (8-3), the results presented in Table (8-10) are obtained.

To make the interpretation of the results easier, they are presented graphically as shown in Figure (8-4). The numerical results are synthesized using the so-called radar diagrams (for more explanation about the radar diagram, refer to section 3.2.7.1), where the leader village reaches the score of 100 in any individual indicator.

8.2.2.1 Analyzing Results

As can be recognized in Figure (8-4), problems in each village are clearly highlighted. Presenting the village performance in this manner draws attention to issues which should be considered important policy priorities. Moreover, it alleviates the disadvantages of aggregating all the indicators into one composite indicator as explained in the first approach.

Indicator / village	Leader Value	Kafr Shebeen	Tahanoob	Nawa	Al Mreeg	Tehoriah	Menshaat Al keram	Al Afraz	Al Gaitra
Local authority empowerment (Yes/No)	100	0	0	0	0	0	0	0	0
Flexibility over resources distribution (Yes/No)	100	0	0	0	0	0	0	0	0
Size of local revenues (L.E./capita)	7867	36.7	75.7	43.4	61.4	61.4	100.0	58.2	54.2
Urban growth rate (%)	3.0	65.3	100.0	44.0	87.6	38.7	69.7	41.3	30.7
Unemployment rate (%)	4.8	52.2	43.2	100.0	43.6	54.5	34.5	61.5	81.4
Real GDP per capita (ppp$)	3275.8	80.7	79.2	100.0	74.6	87.7	73.2	78.5	69.8
Women in labor force (%)	20.2	82.2	100.0	36.1	36.6	95.0	37.6	47.5	27.2
Population growth rate (%)	1.103	98.0	98.9	99.6	100.0	95.3	99.7	95.7	99.1
Life expectancy at birth (Years)	68.1	99.6	98.8	98.4	98.5	100.0	98.7	98.7	99.6
Beds per 10000 people (Beds)	26.1	80.1	80.5	89.3	76.2	90.0	93.5	100.0	80.1
Adult literacy rate (%)	74.8	100.0	96.8	87.2	95.9	82.0	79.8	72.6	63.9
Combined 1st, 2nd &3rd level gross enrolment ratio (%)	71.5	99.3	99.6	99.3	100.0	99.7	99.3	99.2	100.0
Annual loss of agricultural land	2.1	31.3	50.7	35.0	100.0	94.6	79.5	47.9	63.6
Population connected to sanitary drainage network (%)	0	0	0	0	0	0	0	0	0
Population connected to water network (%)	90	100.0	98.0	72.0	79.9	83.0	88.9	79.4	62.8
Presence of sources of air pollution	1	33.3	33.3	33.3	100.0	50.0	100.0	50.0	50.0

Table (8-10): Benchmarking exercise for the test sample villages by using the distance from the leader method

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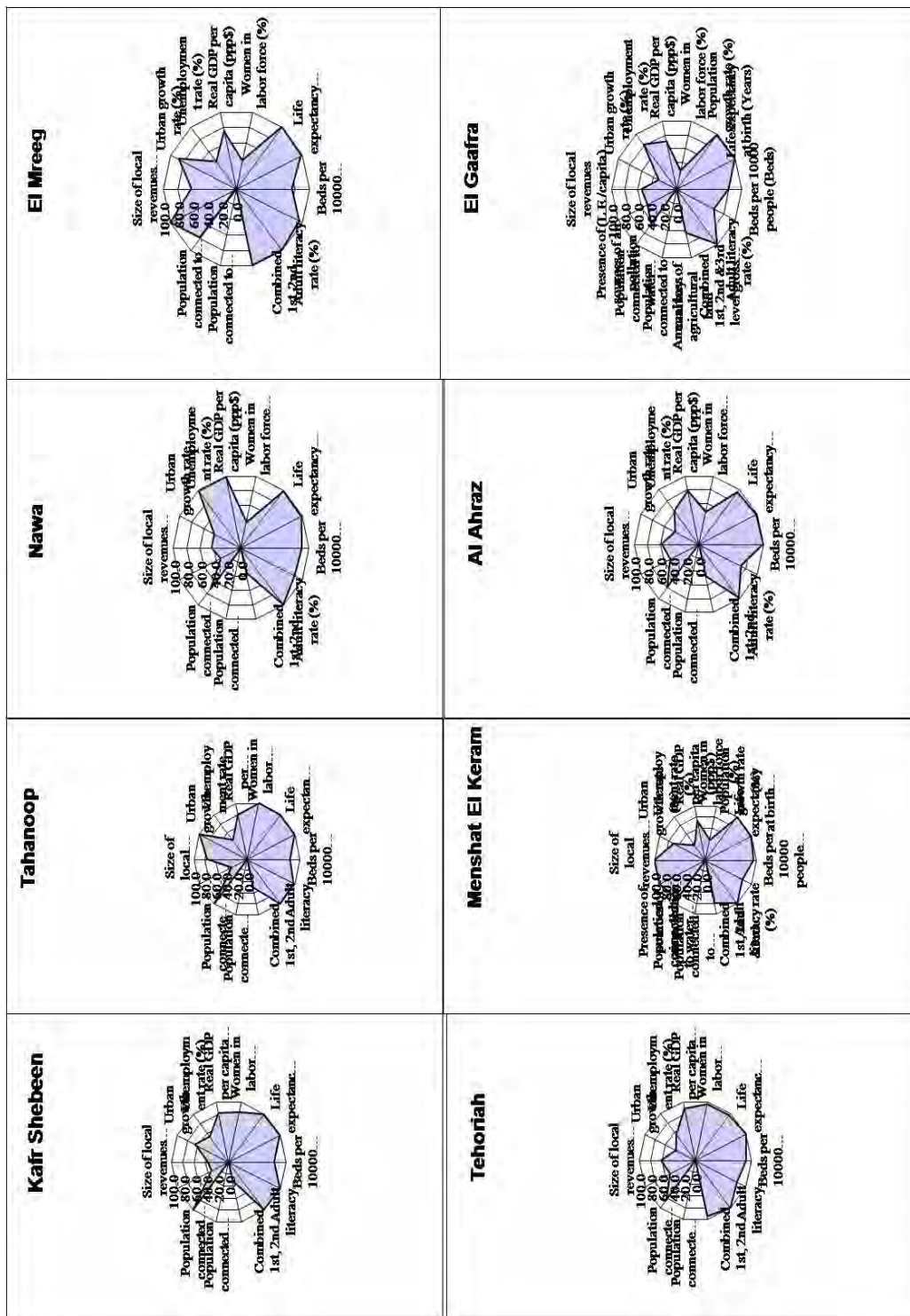
Figure (8-4): Graphical presentation of the assessment results by using "Radar Diagrams"

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However, it ought to be noted that this technique has some limitations as well. It indicates a villages' performance within the scope of assessment (i.e. the test sample village) principally in a *comparative* manner to the leader village. The leader village is represented by the score 100 and the other village are represented as percentages of 100. However, this does not necessarily mean that the leader village has an ***absolute*** best performance. For example, Kafr Shebein has the leader value for population connected to water network amongst test sample villages, which reached 90%. In relation to the test sample villages, 90% is the best value, but it is not the ideal state required for villages. If the scope of assessment is widened to encompass for example the Qalyobia governorate and the leader value becomes 100%, the scores of the other villages will change considerably.

A close look at Figure (8-4) provides a comparative view about the performance of the test sample villages. Findings of the assessment can be read clearly from the graphical presentation. They can be summarized as follows:

- A common problem in all villages is the lack of adequate sanitary drainage systems.
- All villages perform well in the population growth rate, life expectancy at birth and the combined 1st, 2nd &3rd level gross enrolment ratio. They are very close to each other as well as to the leader village. This is principally due to the closeness of their actual values as shown earlier in Table (8-3).
- There is considerable variation amongst the test sample villages in relative to some of the indicators, which highlights problems in each village. For example, El-Gaafra has problems in the urban growth rate and women in the labour force. Menshaat El-Keram has problems in the unemployment rate and women in the labour force. Kafr Shebein has problems in the presence of sources of air pollution and annual loss of agricultural land.

One of the remarkable findings that reinforce the argument of this research clearly appears in Kafr Shebein case. This shows how the assessment using the integrative set of indicators can provide policy makers with a vision that differs greatly from the one provided by

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assessment using the HDIs. According to the HDI values, Kafr Shebein is ranked first amongst the test sample villages as shown in Table (8-8), which means that its performance with regard to social and economic development is completely satisfactory. On the other hand, it ranks the fifth according to the SDI ranking. As can be clearly recognized from the graphical presentation in Figure (8-4), Kafr Shebein has considerable problems with regard to some of the indicators under the environmental theme, primarily the presence of sources of air pollution and annual loss of agricultural land. Thus, taking all the different factors together while assessing the village's performance would definitely lead to a more reliable and accurate result.

8.3 Conclusion

Two different approaches to assess villages' performance based on their indicator states are employed in this chapter. The first approach aimed at ranking villages by aggregating the individual indicators into one composite indicator (i.e. the SDI), while the second approach aimed at assessing villages' performance according to the values of the individual indicators.

Results of the first approach using the SDI indicated extremely diverse rankings from the rankings of the HDI with regard to the same test sample of villages. This confirms the basic assumptions of this research that multi criteria evaluation can yield different results from evaluation of social and economic components only which are represented by the HDI. Thus, if a comparative assessment between a numbers of villages based on the value of a single composite indicator is required, then the SDI would definitely be of better utility to policy and decision – makers.

However, there are a number of very significant disadvantages with this approach, which can misrepresent the real situation and mask reality. Its main disadvantage is the implied compensability among the different individual indicators. Compensability refers to the existence of trade-offs, i.e. the possibility of offsetting a disadvantage of some criteria by a sufficiently large advantage in another criterion. This means that an excellent performance in the economic dimension can justify any type of

poor performance in for example the environmental dimension, which is exactly what the concept of sustainability attempts to avoid. Moreover, a single composite indicator is of limited utility in capturing the real problems in each village, which lessens the powerful role of indicators, particularly in defining priorities and altering perceptions.

To alleviate the disadvantages of the first approach, the second approach is employed. It indicates villages' performance based on the values of individual indicators. Thus, it can be easily used for policy purposes. In this technique, a reference value or a benchmark is established for every individual indicator in order to assess current performance and monitor progress over time. The assessment results are presented graphically using the so-called radar diagrams, which has proved to be a valid tool to visualize changes and enable relative comparisons across a number of cases, to make the interpretation of the results easier.

Presenting the village performance in this manner highlighted problems in each village clearly and drew attention to issues, which should be considered important policy priorities. However, this approach has some limitations as well. It indicates villages' performance within the scope of the test sample village, principally in a comparative manner to the leader village. However, this does not necessarily require that the leader village has an absolute best performance. So, this consideration has to be taken into account when using this technique of assessment

The two approaches presented two different assessment techniques. Deciding which of them to utilize is fundamentally based on the purpose of the assessment.

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Chapter (9): Conclusions and Reflections

Introduction

This chapter summarizes the conclusions from the research and explores to what extent the research findings fulfilled their aim and objectives as well as answering the research questions. Then, it reflects on the significance of the research through showing how the findings contribute to current academic debate and practical schemes with regard to developing and applying SIs. It sheds light on what it has realized and what remained unachievable. Following this is a critical reflection upon the approaches employed in this research to carry out the different steps of the adopted process to develop a set of SIs appropriate to the Egyptian village context. It ends with suggesting potential areas for further research, which could not be tackled within the context of this research.

9.1 The conclusions from the research

To conclude, it is important at this stage to return to the main aim and objectives as well as the questions of this research and investigate to what extent the research succeeded in fulfilling them. While setting out the research aim and objectives in the introductory chapter, research aim has been introduced first, followed by the research objectives. In this section, the order will be reversed, research findings will be presented in direct relation to the main research objectives, and then fulfilling the main objectives should lead to realizing the research aim. Answers to research question fit in its appropriate positions to realize the research aim and objectives.

The first objective: Defining the meaning of sustainable rural development in Egypt in terms of identifying sustainability goals and objectives within the Egyptian village context.

This objective is fulfilled in chapter (7). Based on the identified key issues of concern by the different stakeholders in the National Project for Preparing the Strategic Development Plans for Egyptian Villages and derived from the universal definition of sustainability goals as illustrated

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at the Johannesburg summit and the MDGs, along with some adaptation to the context of rural Egypt, the sustainability goals and objectives are defined. The role of the public in defining the sustainability goals and objectives is emphasized, which corresponds to the spirit of the concept of sustainable development as explained earlier in section 2.1.

The second objective: Establishing a model, which envisages the current processes for a typical rural Egyptian village and addresses the interrelationships between the various system components in terms of environmental, economic, social and institutional components. This model should provide insight into the gaps, constraints and challenges currently threatening the sustainability of Egyptian villages.

This objective is directly connected to the first two of the four research questions which are:
- *What are the key issues that compose the system components and envisage the current processes for the Egyptian village?*
- *How to address the complex interrelationships between such system components?*

Answers to these questions formed the underpinning for establishing the "Egyptian Rural System Model", which is the fulfilment of the second objective, as explained in section 7.5. For the first question, key issues are identified by the different groups of stakeholders based on the findings of the National Project for Preparing the Strategic Development Plans for Egyptian Village. Then for the second question, addressing the interrelationships between the system components is carried out in terms of complex circular feedback loops as shown earlier in Figure (7-1), based on the concept of "Systems Thinking" to describe the key issues and the linkages amongst them explicitly and in detail. Establishing this model is perceived by the researcher as an initial attempt to fill a common gap in the reviewed examples of practical projects for developing and applying SIs in practice, many of which neglect the complexity of the interrelationships between the various system components. Moreover, it is considered the bedrock for composing the three sets of SIs developed within the context of this research to assess the performance of villages.

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The third objective: Developing a set of SIs which allow the interactions between factors in such villages to be tracked and the impact of policy interventions to be assessed in order to monitor and evaluate the progress of these villages on the path of sustainable development.

This objective is directly connected to the third research question which is:
What are the appropriate sustainability indicators that represent these issues?

The answer to the third question as well as the fulfilment of the third objective of this research is represented in form of establishing three sets of indicators: *the comprehensive, the core* and *the provisional* sets of SIs consecutively, as explained in chapter (7). Each set is established to fulfil a certain purpose.

The *comprehensive* set of SIs, which capture all the important aspects of sustainable development is established to provide decision-makers with a comprehensive vision about the current status of a particular village, so that it can be an essential accounting system for tracking developing trends. However, it contained a vast number of indicators, which is usually perceived by decision-makers as undesirable and might limit its usefulness. Therefore, the *core* set of SIs is established, which has a limited number of key representative indicators and can reduce the volume of information to a workable level for decision-makers. It aims at highlighting issues of crucial importance, which should be considered important policy priorities. However, in order to examine the applicability of the core set of SIs, data availability is considered an obstacle. Some of the indicators in the core set lack data, and in order to measure villages' performance practically, data availability is essential. As a result, substitute indicators with available data replaced the original indicators that lack data. This resulted in establishing the third set of SIs: the *provisional* set of SIs, to be used only within this research context.

By fulfilling the third objective, the research aim is almost realized, which is:

To develop a set of SIs appropriate to the Egyptian villages' context. Therefore, it can be a guiding policy instrument for decision and policy makers, donors and concerned authorities in drawing policies, monitoring development and allocating resources on a fair basis.

However, to fulfil the fourth objective as well as to answer the fourth research question an examination of the applicability and reliability of the developed set of SIs is required.

The fourth objective: Examining the impact of integrating the environmental and institutional components, which are neglected in the HDI on the assessment findings of the newly developed integrated set of SIs. This impact will be examined through applying both tools of assessment on a particular village

This objective is directly connected to the fourth research question, which is:

Are these SIs valuable enough to replace the HDIs i.e. Does assessing progress using SIs lead to different results than using HDIs?

To answer this question, a broad look at the findings of the assessment exercise to assess village's performance, carried out in chapter (8), is required. Two different approaches to assess villages' performance based on their indicator states are employed in chapter (8). The first approach aimed at ranking villages by aggregating the individual indicators in one composite indicator (i.e. the SDI), while the second approach aimed at assessing villages' performance according to the values of the individual indicators. Each technique has its own advantages and disadvantages. However it was clear that the integrative set of SIs provided a more holistic vision about the village's performance than the set of the HDIs. Moreover, the assessment findings confirmed that integrating the neglected dimensions in the HDI into the integrative set of SIs resulted in considerable differences in the overall results. To be able to recognize these differences comprehensibly, a synthesizing of assessment outcomes based on values of individual indicators resulted from both the integrative set of SIs and the set of HDIs is presented by radar diagrams as shown in Figures (9-1) and (9-2).

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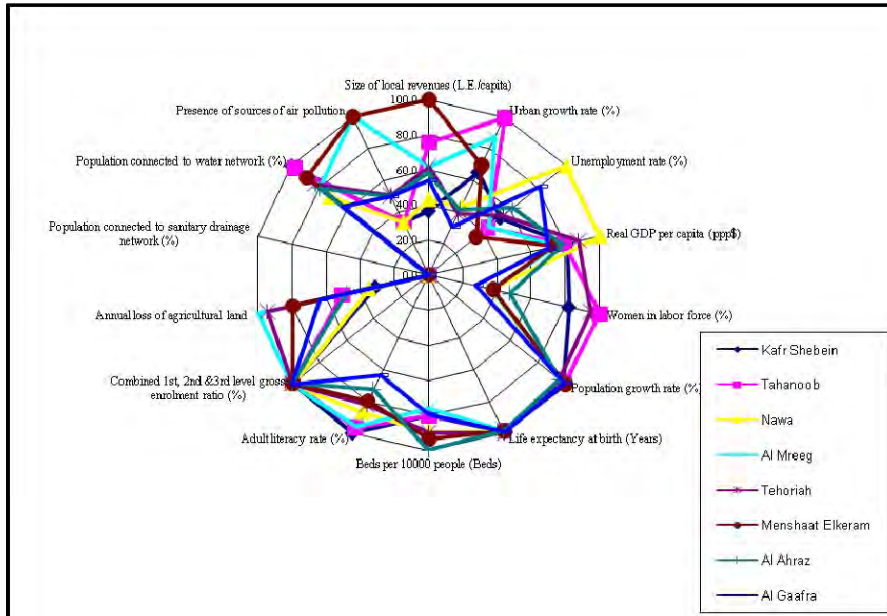
Figure (9-1): Radar diagram comparing the eight villages of the test
sample according to their performance assessmnet by the integrative set
of SIs
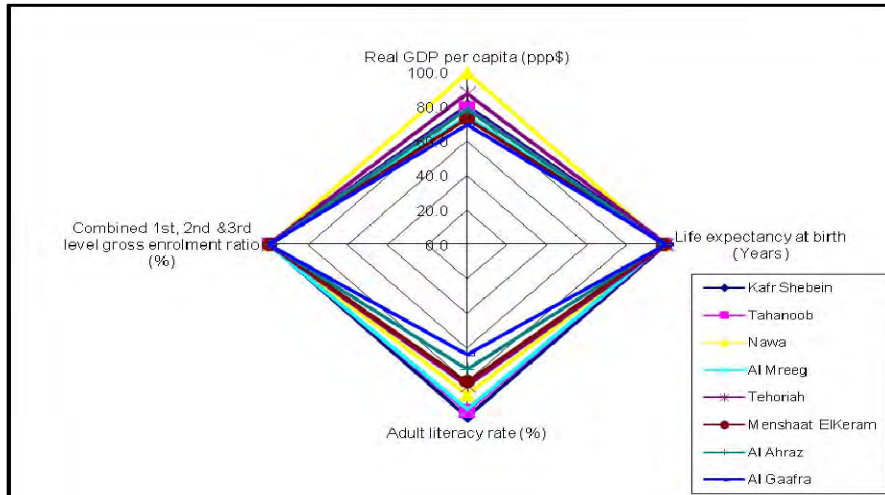
Figure (9-2): Radar diagram comparing the eight villages of the test
sample according to their performance assessmnet by the set of HDIs

As can be noticed in the graphical presentation of the results, values achieved using the HDIs are very close amongst the test sample villages, which made distinguishing differences in each village a very difficult task. On the other hand, values achieved using the integrated set of SIs vary noticeably from one village to another, which reflects clearly the strength and weaknesses points in each of them. Based on these findings, the answer to the fourth research question from the researcher point of view is *YES*. The integrated set of SIs is valuable enough to replace the set of HDIs in providing a clearer and more reliable vision about the village's performance.

The conclusions indicated that the research aim and objectives have been fulfilled and the research questions have been answered. However, to what extent the adopted approach and the methodology used were appropriate and effective, this needs to be reflected on. The next section examines in more detail the appropriateness and the effectiveness of the particular approach and techniques employed in this research to fulfill its aim and objectives as well as to answer its questions.

9.2 Reflections on the research

There were a number of limitations to the research which need to be considered when deciding how reliable the results were. Following the same sequence in the preceding section, reflections on the research are principally concerned the adopted approach and methodology used to carry out the process of developing the integrative set of SIs, in which the main steps can be summarized as follows:

1. Establishing the "Egyptian Rural System Model",
2. Identifying the comprehensive, the core and the provisional SIs sets, and
3. Testing the applicability of the provisional set of SIs.

1. The village model is established based on the concept of "System Thinking" (Pegasus Communications Inc. 2000a; Pegasus Communications Inc. 2000b; Bellinger 2004a; Bellinger 2004b). A broad explanation of the concept and the efficiency of its tools are demonstrated in section 2.4. What needs to be reflected on with

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regard to the village model, concerns whether it is convenient and can be understood by policy makers or non specialists. The issue of *complexity / simplicity* trade-off was of significant concern within the context of this research and has been broadly addressed in chapter (2). The researcher believes that it is crucial to describe the issues and the **complex** linkages between them explicitly and in detail, both to help choose the relevant indicators, and to help explain to the intended users how current processes interact in reality. On the other hand, consideration must be given to carrying out this process in an easy and **simple** manner to make it useful for the intended users. To what extent the researcher succeeded in handling the issue of complexity / simplicity, needs to be examined. This might be carried out by presenting the model to non-specialists and getting feedback from them, which could help in amending the model to get the best use from it.

2. A number of issues concerned with identifying the comprehensive, the core and the provisional SIs sets need to be reflected on as follows:

• Firstly, the process of identifying the indicators that composed the three SIs sets employed in this research is driven from the "Integrated Methodology" approach (Mark Reed, Evan D. G. Fraser et al. forthcoming) and its allied concept the "Social Multi Criteria Evaluation" (SMCE) (Munda 2004). They emphasize the inclusion of the public in all phases of the process as a means to generate indicators which are more relevant to the local context, reflect the local perceptions of the rural system and enhance community capacity for learning and understanding. However, due to the reasons specified in section 6.2 which mainly result from the fact that practicing participation in Egypt is in its infancy and the need for a unified set of indicators applicable across rural Lower Egypt, stakeholders are only engaged in identifying their key issues of concern, problems and priorities. The rest of the process, including identifying, selecting, revising, testing and applying indicators was carried out by the researcher exclusively. From the researcher's point of view, carrying out the process in this manner is pragmatically more suited to the nature of the Egyptian village. Following the theoretical approach and its allied concept literally would not serve the purpose of this research,

but allowing some flexibility to adapt the approach to the real situation on the ground would be definitely more helpful to the research context. However, these limitations are not lingered over for long. In the future, with further experience of practicing participation in Egypt for both the experts and the public, stakeholders' role can be broadened. They can be involved in all phases of the process. This mandates the establishment of stronger relationships between the experts and the public. The guidelines of successful sustainable rural development identified by Chambers (1988) and the Participatory Rural Appraisal (PRA) (Chambers 1997) explained earlier in section 5.3 are worth revisiting at this stage. The adopted process might well be a fruitful starting point, but would have to be modified substantially to involve stakeholders to a greater degree in the whole process, not only in identifying the key issues of concern. This involvement would inevitably yield considerable results and changes to the process of identifying, selecting, revising, testing and applying the indicators.

However, to what extent more participation can be helpful remains an interesting question, which needs to be investigated further.

- *Secondly*, an analytical look at the developed set of SIs in relative to Maclaren's criteria for distinguishing SIs from simple traditional indicators identified in section 2.2.2 indicates partial success in fulfilling these criteria, given that fulfilling these criteria all together is a huge challenge and rarely can be fulfilled. The four distinguishing criteria for SIs were: integrating, forward looking, distributional, and developed with input from multiple stakeholders in the community. The developed set of SIs is definitely integrating, partially forward looking, non-distributional and partially developed with input from stakeholders in the community. The latter concerns stakeholders' involvement in identifying their key issues of concern and development priorities. Thus, it can be recognized that, although the new integrative set of SIs is imperfect, it includes a constructive initiative for developing a comprehensive assessment tool, which can be a successful policy instrument.

- *Thirdly,* the issue of uncertainty has considerable implications on the adopted process. These uncertainties can be specified as follows:

A. *Subjectivity*: identifying the comprehensive set of SIs, then selecting the core set of SIs and consequently the provisional set of SIs, represents only the researcher's point of view. If this exercise is carried out by someone else who perceives the priorities in a different way, then the selected indicators would certainly alter. Consequently, the values of the indicators state showing the village's performance would definitely change and the assessment findings are likely to change as well. However, there are certain techniques which can be very helpful in tackling the issue of subjectivity. For example, the **Delphi method**, which is a technique to build an agreement, or consensus about an opinion or view, without necessarily requiring people to meet face to face, such as through surveys, questionnaires, emails etc., could be employed to alleviate the subjectivity drawbacks. For more details about this technique see (Norman Dalkey and Olaf Helmer 1963; Theodore Jay Gordon 1994; Harold A. Linstone and Murray Turoff 2002).

B. *Quality of information available*: as explained earlier in section 7.8, data for some of the core set of SIs was not available. Alternatively, indicators that lack data are substituted with others for which data is available to be able to get values and assess village's performance, which resulted in the provisional set of SIs. Furthermore, some of the substitute indicators are built on researcher's assumptions which means that their values lack accuracy. Consequently, the assessment findings are based on approximate not accurate values. If the core set of SIs is measured, values would certainly change and the assessment findings would be expected to change as well.

- *Fourthly*, this issue concerns the function of the "Egyptian Rural System Model" in identifying the representative indicators. The developed sets of SIs only represent the system component in the model; however, the links between these components remained immeasurable. This undermines the powerful role the model should play. In fact, this limitation is not only within this research context, but also in all the reviewed examples for developing and applying sets of SIs in practice. However, one of the basic criteria for selecting the core

set from the comprehensive set of SIs as explained in section 7.7, should be that each representative indicator should be related strongly to sustainability goals and objectives and should have considerable linkages to other issues within the model. From the researcher's point of view, this was an attempt to overcome the linkage problems and an initiative to meet the issue of addressing the linkage between the system components. However, this has remained an interesting discourse to be more investigated in more detail in further research.

3. The employed techniques to test the applicability of the provisional set of SIs as explained in chapter (8) encompassed two different approaches. A broad explanation of the both techniques and their advantages and disadvantages are largely demonstrated in section 8.2. Conversely, the mathematical sophisticated algorithm and the technical aspects of each of them was not discussed in detail, as this was not the focus of this research. However, if the assessment exercise is to be carried out in a real situation, more attention should be given to the selection of the appropriate mathematical technique. If the matter of accuracy and reliability has the first priority, then a more sophisticated mathematical technique is essentially required, as it will have a substantial impact on the assessment outcomes. Moreover, the issue of weight and using weighting coefficients can affect the trade-off amongst the different issues considerably and consequently influence the assessment findings significantly.

9.3 Recommendations for further research

The conclusions and reflections in the preceding sections suggest the need for further research in a number of fields. Moreover, there are significant areas that could not be covered within the research scope, which are highly recommended for further research. They can be summarized in this section in the following points:

• The developed sets of SIs principally concern rural Lower Egypt. However, they can be adapted to be applicable to rural Egypt in general. The fundamental adaptation concerns identifying the issues of concern, which is the underpinning of establishing the "Egyptian Rural

System Model". Consequently, alterations in addressing the linkages between the key issues of concern would probably happen to envisage the modified processes. The rest of the process should be similar to the one concerned with rural Lower Egypt. However, further research is highly recommended to examine the whole process within the context of different localities in rural Egypt, i.e. Upper Egypt and Frontier Governorates.

- The village model is established based on the concept of "Systems Thinking". Though systems thinking proved validity in better understanding a particular system's structure and behavior, enhanced communication with others about these understandings and designing high-leverage interventions for problematic system behavior, it has limitations in testing the impact of these high-leverage interventions. Computer simulation models and management "flight simulators," which are emphasized in the "System Dynamic" concept can alleviate this limitation. Building a computer simulation model for the "Egyptian Rural System Model" could be very helpful to assess the impact of alternative policies and different scenarios to alleviate the problems highlighted in the system and fulfill the development needs. There are four software programs that were designed to facilitate the building and use of System Dynamics models; Dynamo, iThink/Stella, PowerSim and Vensim (isee systems inc. 1985-2006; Ventana Systems Inc. 1996-2005; Powersim Software AS 2006). In addition, a number of other modeling and simulation environments which provide some support for building system dynamics models are listed in Eberlein (2006). It is possible to perform good system dynamics work with many different tools, including spreadsheets and programming languages, though this is not usually practical. Further research in the "System Dynamic" field and its software is required to select the appropriate technique for establishing the computer simulation model.

- Measuring the links between the rural system components, not only the components themselves is quite important. This is partially tackled in the "Egyptian Rural System Model". However, further

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research is requisite to find a means to measure these links and investigate whether their measurement resulted in significant impacts on the assessment findings.

- Engaging the public in the whole process of developing the integrative set of SIs is recommended in the recent future, with further experience gained of practicing participation in Egypt for both the experts and the people. Adopting the full mechanism suggested in the "Adaptive Learning process" or the "Integrated Methodology" will be useful at this stage. An empirical application of the process in a real situation is quite important to explore the effects of a full public involvement in the process of developing an integrative set of SIs on the outcomes.

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Appendix (A): Indicator lists developed in the study sample projects for developing SIs

(A-1) Indicators of sustainable development: guidelines and methodologies

(United Nations Commission on Sustainable Development UNCSD)

Table (A-1-1) Key Themes Suggested by CSD Testing Country Priorities

Social	Environmental
Education	Freshwater/groundwater
Employment	Agriculture/secure food supply
Health/water supply/sanitation	Urban
Housing	Coastal Zone
Welfare and quality of life	Marine environment/coral reef protection
Cultural heritage	Fisheries
Poverty/Income distribution	Biodiversity/biotechnology
Crime	Sustainable forest management
Population	Air pollution and ozone depletion
Social and ethical values	Global climate change/sea level rise
Role of women	Sustainable use of natural resources
Access to land and resources	Sustainable tourism
Community structure	Restricted carrying capacity
Equity/social exclusion	Land use change
Economic	**Institutional**
Economic dependency/Indebtedness/ODA	Integrated decision-making
Energy	Capacity building
Consumption and production patterns	Science and technology
Waste management	Public awareness and information
Transportation	International conventions and cooperation
Mining	Governance/role of civic society
Economic structure and development	Institutional and legislative frameworks
Trade	Disaster preparedness
Productivity	Public participation

Table (A-1-2) CSD core indicators in both of the (Theme-Sub theme) and the (Driving Force-State-Response) Indicator Frameworks

Social					
Theme	**Sub-theme**	**Indicator**	**DF**	**S**	**R**
Equity	Poverty[13] (3)	Percent of Population Living below Poverty Line		X	
		Gini Index of Income Inequality		X	
		Unemployment Rate	X		
	Gender Equality (24)	Ratio of Average Female Wage to Male Wage		X	
Health (6)	Nutritional Status	Nutritional Status of Children		X	
	Mortality	Mortality Rate Under 5 Years Old		X	
		Life Expectancy at Birth		X	
	Sanitation	Percent of Population with Adequate Sewage Disposal Facilities		X	
	Drinking Water	Population with Access to Safe Drinking Water		X	
	Healthcare Delivery	Percent of Population with Access to Primary Health Care Facilities			X
		Immunization Against Infectious Childhood Diseases			X
		Contraceptive Prevalence Rate			X
Education (36)	Education Level	Children Reaching Grade 5 of Primary Education	X		
		Adult Secondary Education Achievement Level	X		
	Literacy	Adult Literacy Rate	X		
Housing (7)	Living Conditions	Floor Area per Person		X	
Security	Crime (36, 24)	Number of Recorded Crimes per 100,000 Population		X	
Population	Population	Population Growth Rate	X		

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[13] Numbers in brackets indicate relevant Agenda 21 chapters.

Theme	Sub-theme	Indicator	DF	S	R
(5)	Change	Population of Urban Formal and Informal Settlements		X	
Environmental					
Theme	**Sub-theme**	**Indicator**	**DF**	**S**	**R**
Atmosphere (9)	Climate Change	Emissions of Greenhouse Gases	X		
	Ozone Layer Depletion	Consumption of Ozone Depleting Substances	X		
	Air Quality	Ambient Concentration of Air Pollutants in Urban Areas		X	
Land (10)	Agriculture (14)	Arable and Permanent Crop Land Area		X	
		Use of Fertilizers	X		
		Use of Agricultural Pesticides	X		
	Forests (11)	Forest Area as a Percent of Land Area		X	
		Wood Harvesting Intensity	X		
	Desertification (12)	Land Affected by Desertification		X	
	Urbanization (7)	Area of Urban Formal and Informal Settlements		X	
Oceans, Seas and Coasts (17)	Coastal Zone	Algae Concentration in Coastal Waters		X	
		Percent of Total Population Living in Coastal Areas	X		
	Fisheries	Annual Catch by Major Species	X		
Fresh Water (18)	Water Quantity	Annual Withdrawal of Ground and Surface Water as a Percent of Total Available Water	X		
	Water Quality	BOD in Water Bodies		X	
		Concentration of Faecal Coliform in Freshwater		X	
Biodiversity (15)	Ecosystem	Area of Selected Key Ecosystems		X	
		Protected Area as a % of Total Area			X
	Species	Abundance of Selected Key Species		X	

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ECONOMIC					
Theme	**Sub-theme**	**Indicator**	**DF**	**S**	**R**
Economic Structure (2)	Economic Performance	GDP per Capita	X		
		Investment Share in GDP	X		
	Trade	Balance of Trade in Goods and Services		X	
	Financial Status (33)	Debt to GNP Ratio		X	
		Total ODA Given or Received as a Percent of GNP	X		
Consumption and Production Patterns (4)	Material Consumption	Intensity of Material Use		X	
	Energy Use	Annual Energy Consumption per Capita	X		
		Share of Consumption of Renewable Energy Resources		X	
		Intensity of Energy Use		X	
	Waste Generation and Management (19-22)	Generation of Industrial and Municipal Solid Waste	X		
		Generation of Hazardous Waste	X		
		Generation of Radioactive Waste	X		
		Waste Recycling and Reuse			X
	Transportation	Distance Traveled per Capita by Mode of Transport		X	
INSTITUTIONAL					
Theme	**Sub-theme**	**Indicator**	**DF**	**S**	**R**
Institutional Framework (38, 39)	Strategic Implementation of SD (8)	National Sustainable Development Strategy			X
	International Cooperation	Implementation of Ratified Global Agreements			X
Institutional Capacity (37)	Information Access (40)	Number of Internet Subscribers per 1000 Inhabitants		X	
	Communication Infrastructure (40)	Main Telephone Lines per 1000 Inhabitants		X	
	Science and Technology (35)	Expenditure on Research and Development as a Percent of GDP			X

	Disaster Preparedness and Response	Economic and Human Loss Due to Natural Disasters	X		

A-2 Sustainable Development in the United States: An Experimental Set of Indicators

(The U.S. Interagency Working Group on Sustainable Development Indicators)

Table (A-2-1) U.S. Interagency Working Group on SDI Issues & Indicators

Issue	*Selected Indicators*
Economic Prosperity	• Capital Assets • Labor Productivity • Domestic Product
Fiscal Responsibility	• Inflation • Federal Dept to GDP Ratio
Scientific & Technological Advancement	• Investment in R&D as a percentage of GDP
Employment	• Unemployment
Equity	• Income Distribution • People in Census Tracts with 40% or Greater Poverty
Housing	• Homeownership Rates • Percentage of Households in Housing Problems
Consumption	• Energy Consumption Per Capita & Per $ of GDP • Materials Consumption Per Capita & Per $ of GDP • Consumption Expenditure Per Capita
Status of Natural Resources	• Conversion of Cropland to Other Uses • Soil Erosion Rates • Ratio of Renewable Water Supply to Withdrawals Fisheries Utilization • Timber Growth to Removals Balance
Contamination & Hazardous Materials	• Contaminants in Biota • Identification and Management of Superfund Sites • Quantity of Spent Nuclear Fuel

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Ecosystem Integrity	• Acres of Major Terrestrial Ecosystems • Invasive Alien Species
Global Climate Change	• Greenhouse Gas Emissions • Greenhouse Climate Response Index
Stratospheric Ozone Depletion	• Status of Stratospheric Ozone
Population	• U.S. Population
Family Structure	• Child Living in Families with only one Parent Present • Births to single Mothers
Arts & Recreation	• Outdoor Recreational Activities • Participation in the Arts & Recreation
Community Involvement	• Contributing Time & Money to Charities
Education	• Teacher Training Level and Application of Qualifications • Educational Attainment by Level
Public Safety	• Crime Rate
Human Health	• Life Expectancy at Birth

Table (A-2-2) SDI multiple View of Indicators, combines the framework organized the indicators based on the economic, environmental, and social subcategories and the framework organized the indicators based on the categories of long-term endowments and liabilities, processes, and current results

Long-term Endowments & Liabilities		
Economic	*Environmental*	*Social*
1. Capital Assets 2. Labor Productivity 3. Federal Dept to GDP Ratio	1. Surface Water Quality 2. Acres of Major Terrestrial Ecosystems 3. Contaminants in Biota 4. Quantity of Spent Nuclear Fuel 5. Status of Stratospheric Ozone 6. Greenhouse Climate Response Index	1. U.S. Population 2. Children Living in Families with only one Parent Present 3. Teacher Training Level and Application of Qualifications
Processes		

Economic	Environmental	Social
4. Energy Consumption Per Capita & Per $ of GDP 5. Materials Consumption Per Capita & Per $ of GDP 6. Inflation 7. Investment in R&D as a percentage of GDP	7. Ratio of Renewable Water Supply to Withdrawals 8. Fisheries Utilization 9. Invasive Alien Species 10. Conversion of Cropland to Other Uses 11. Soil Erosion Rates 12. Timber Growth to Removals Balance 13. Greenhouse Gas Emissions 14. Identification and Management of Superfund Sites	4. Contributing Time & Money to Charities 5. Births to single Mothers 6. Educational Attainment by Level 7. Participation in the Arts & Recreation 8. People in Census Tracts with 40% or Greater Poverty
Current Results		
Economic	Environmental	Social
8. Domestic Product 9. Income Distribution 10. Consumption Expenditure Per Capita 11. Unemployment 12. Homeownership Rates 13. Percentage of Households in Housing Problems	15. Metropolitan Air Quality Nonattainment 16. Outdoor Recreational Activities	9. Crime Rate 10. Life Expectancy at Birth 11. Educational Achievement Rates

A-3 Sustainable development indicators in your pocket 2005
(A baseline for the UK Government Strategy indicators)
The Department for Environment, Food and Rural Affairs (DEFRA) &
National Statistics
Table (A-3-1) UK framework indicators summary

Indicator		Change since 1990	Change since 1999	Direction in latest year*
Greenhouse gas emissions		✔	≈	✗
Resource use		✔	≈	≈
Waste		…	≈	≈
Bird populations	farmland	✗	≈	≈
	woodland	≈	≈	≈
	coastal	✔	✔	≈
Fish stocks		…	✔	✔
Ecological impacts of air pollution	acidity	…	✔	✔
	nitrogen		✗	✗
River quality	biological	✔	≈	✔
	chemical			✗
Economic output		✔	✔	✔
Active community participation		…	✔	✔
Crime	vehicles & burglary	✔	✔	✔
	robbery	✗	✗	✔
Employment		≈	✔	≈
Workless households		✔ ₁₉₉₂	✔	≈
Childhood poverty		✔	✔	≈
Pensioner poverty		✔	✔	✔
Education		✔	✔	✗
Health inequality	Infant mortality	✗ ₁₉₉₄	✗	✗
	Life expectancy	✗ ₁₉₉₁	≈	✗
Mobility	Walking/ cycling	✗	✗	✗
	Public transport	✗	≈	≈
Social justice		…	…	…
Environmental equality		…	…	…
Wellbeing		…	…	…

✔ = clear improvement since base year

≈ = little or no change since base year

✗ = clear deterioration since base year

… = insufficient or no comparable data

An example of how indicators are addressed in the UK pocket 2005

Agriculture sector

Fertiliser input, farmland bird population, ammonia and methane emissions and output, 1974 to 2003

Source: BTO, Defra, RSPB
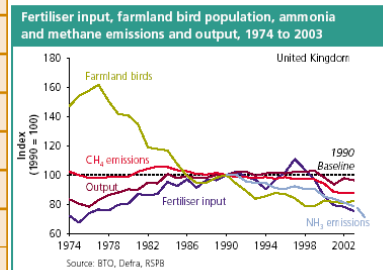
Fertiliser, NH₃, CH₄   since: 1990 ✔   1999 ✔

Farmland birds   since: 1990 ✗   1999 ≈

- Between 1990 and 2003 output from UK agriculture changed little, but in 2003 was 16 per cent higher than in the mid-1970s. By 1997 fertiliser use had risen by over half compared with the mid-1970s but thereafter was considerably reduced. Methane (CH_4) and ammonia (NH_3) emissions have fallen by 12 and 22 per cent respectively since 1990.

- In 2003 farmland bird populations were 18 per cent lower than in 1990, and were 44 per cent lower than in the mid-1970s.

A-4 Sustainable Seattle - Indicators of Sustainable Community
(A volunteer citizen's network)
Table (A-4-1) Indicators of Sustainable Community 1998 & their
sustainability trends

Declining Sustainability Trend

Solid Waste Generated and Recycled
Local Farm Production
Vehicle Miles Traveled and Fuel Consumption
Renewable and Nonrenewable Energy Use
Distribution of Personal Income
Health Care Expenditures
Work Required for Basic Needs
Children Living in Poverty

Improving Sustainability Trend

Air Quality
Water Consumption
Pollution Prevention
Energy Use per Dollar Income
Employment Concentration
Unemployment
Volunteer Involvement in Schools
Equity in Justice
Voter Participation
Public Participation in the Arts
Gardening

Neutral Sustainability Trend

Wild Salmon
Soil Erosion
Population
Emergency Room Use for Non-ER Purposes
Housing Affordability
Ethnic Diversity of Teachers
Juvenile Crime
Low Birthweight Infants
Asthma Hospitalizations for Children
Library and Community Center Use
Perceived Quality of Life

Insufficient Data

Ecological Health
Pedestrian- and Bicycle-Friendly Streets
Open Space
Impervious Surfaces
Community Reinvestment
High School Graduation
Adult Literacy
Arts Instruction
Youth Involvement in Community Service
Neighborliness

(A-5) Neighborhood sustainability indicators guidebook
Crossroads Resource Center /Urban Ecology Coalition – Minneapolis,
Minnesota
**Table (A-5-1) Matrix used by the neighborhood to assess the linkage
between the indicators & issues**

Proposed Deep Sustainability Indicators	How measured	A: Arts & Culture	B: Civic Capacity	C: Diversity	D: Economic Development	E: Education	F: Governance	G: Health	H: Housing	I: Human Capital	J: Natural Environment	K: Public Safety	L: Social Capital	M: Transportation	N: Public Works
1. Percent of residents who have regular contact with ten or more of their immediate neighbors.	Annual resident survey.														
2. Percent of residents who have ever been involved in neighborhood coordination and governance initiatives	Neighborhood organization data base and/or annual resident survey.														
3. Percent of residents involved lifelong in educational programs.	Annual resident survey														
4. Percent of housing built or remodeled following green construction principles (energy efficient, recyclable materials, longevity, flexible uses, minimal repair requirements, aesthetic integrity to place).	Neighbor-hood organization keeps housing data base.														
5. Percent of neighborhood's physical	Public Works department.														

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surface area that is permeable.																		
6. Ratio of annual income earned: highest-income household to lowest-income household.	Annual resident survey.																	
7. Percent of residents owning and operating businesses within neighborhood. (Separate count for cooperative memberships).	Annual resident survey with business survey & information from local community development corporations and lenders.																	
8. Percent of loans obtained by residents from local credit sources (including individual lenders, credit unions, and local lending institutions).	Annual resident survey.																	
9. Economic multiplier for locale: How much additional economic activity in the locale does one dollar generate?	Economic research.																	
10. Percent of energy consumed from renewable sources used renewably.	Work with local utilities to measure.																	
11. Percent of new wealth produced in local industries using renewable resources and practices.	Annual business survey.																	

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12. Percent of residents who walk to local stores to purchase most life essentials.	Annual resident survey.														
13. Percent of local businesses consistently hiring local youth.	Annual business survey.														
14. Percent of food consumed in neighborhood that is grown within 50 miles of neighborhood (with a separate reporting for food grown inside neighborhood).	Survey of local grocers and farmers markets.														
15. Percent of children who are aware from first-hand experience where and how their food is produced.	Local farm to city exchanges/ Community Supported Agriculture farms.														
16. Percent of value from locally harvested natural resources that is reinvested in community															
17. Ecological footprint of neighborhood population.	Measurement to be developed.														
18. Percent of toxic materials produced locally that are safely handled, effectively preventing contamination.	Minnesota Toxic Release Inventory plus information from local producers.														
19. Percent of households involved in	Annual resident survey.														

international exchanges.																	
20. Percent of households in which at least member is fluent in one non-English language.	Annual resident survey.																
21. Number of local foundation dollars committed to partnership with neighbourhood for long-term sustainability initiatives.	Local foundation partners.																
22. Percent of neighborhood organization budget spent for R&D.	Neighborhood organization data bases.																
23. Percent of cultural productions staged locally created by neighborhood artists.	Artists survey and performance spaces/public-ations.																
24. Percent of residents who regularly celebrate their cultural heritage.	Annual resident survey.																

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Appendix (B): Details of Chapter (4) Study Sample Components

Appendix (B): Details of Chapter (4) Study Sample Components

Governorate	Markaz	No. of Villages
Qalyobia	Qalyob	6
	Shebein El Qanater	8
Daqahlya	Sherbein	7
Sharqia	Belbeis	8
Gharbia	El Mahala El Qobra	10
	Basion	4
Total		43
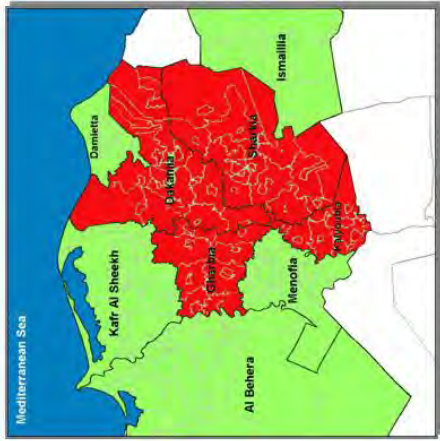
Governorates of Qalyobia, Daqahlia, Sharqia and Gharbia
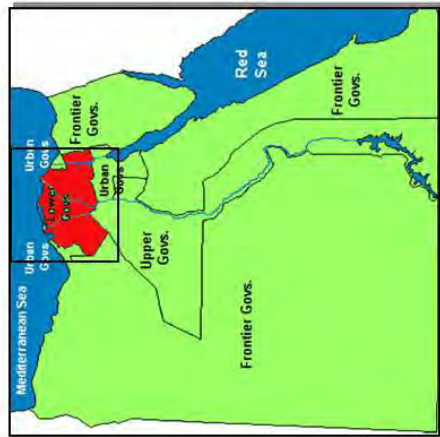
Lower Egypt Governorates
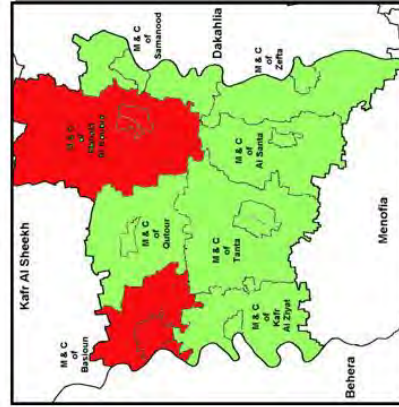
Governorate: Gharbia
Markaz: El Mahala El Qobra &Basion
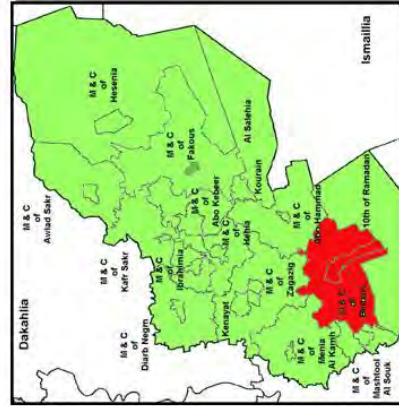
Governorate: Sharqia
Markaz: Belbeis
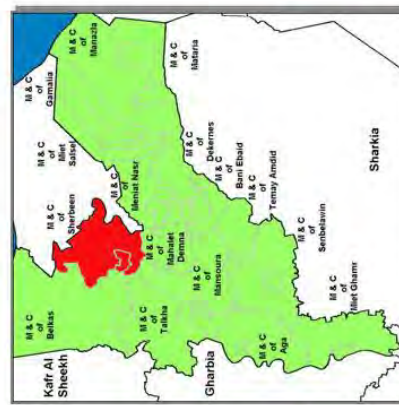
Governorate: Daqahlia
Markaz: Sherbein

Governorate: Qalyobia
Markaz: Shebein El Qanater & Qalyob

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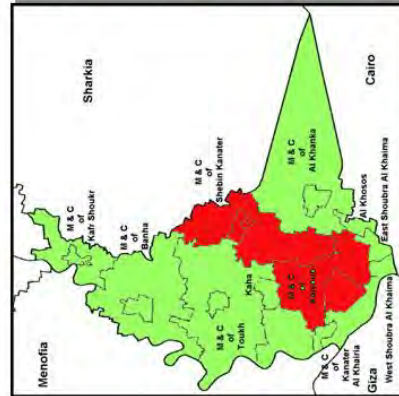
Qalyobia Governorate – Markaz Qalyoub
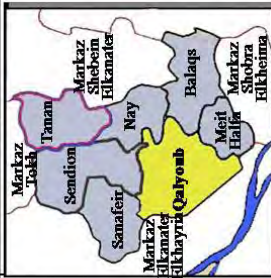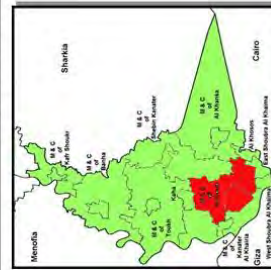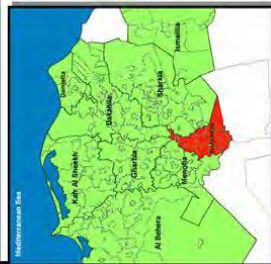
Village	Area 1985 (feddan) inside the physical demarcation	Total area (feddan) 2003	Urban sprawl % outside the physical demarcation
Tanan	142	230.96	%62.6
Sendion	85.5	240.5	%181.3
Sanafeir	60.46	87.03	%43.9
Balaqs	69.1	141.12	%104.2
Meit Halfa	50.8	112.7	%121.9
Nay	44.9	85.72	%90.9

The boundaries of the administrative units & the city of urban sprawl
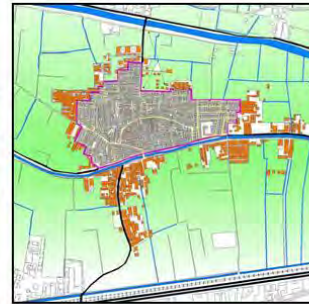
Categories of urban sprawl
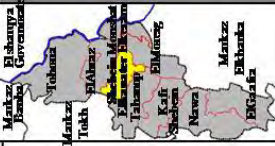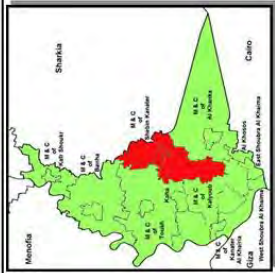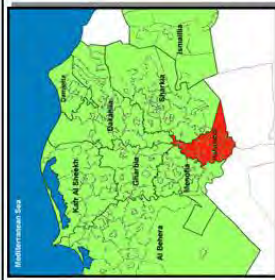
< 50%

50-100 %

100-200 %

>200 %

Sanafeir

Nay

Markaz Qalyoub

Sendion

Meit Halfa

Qalyobia Governorate

Tanan

Balaqs

Qalyobia Governorate - Markaz Shebein El Qanater

Village	Area 1985 (feddan) inside the physical demarcation	Total area (feddan) 2003	Urban sprawl % outside the physical demarcation
ElGaafra	33	88	167%
Tahanop	135	204	51%
ElAhraz	59	132	124%
Tohorya	28	65	132%
Menshaat Elkeram	60	104	73%
Kafr-Shebein	143	255	78%
Nawa	86	186	116%
ElMoreig	60	95	58%

The boundaries of the administrative units & the city of the Markaz

Kafr-Shebien

ElMoreig

ElGaafra

Tohoria

Markaz Shebein El Qanater

Tahanop

Menshat Elkeram

Qalyobia Governorate

Nawa

ElAhraz

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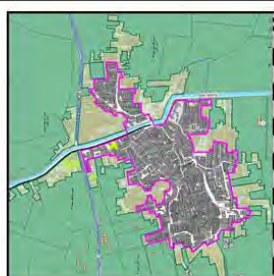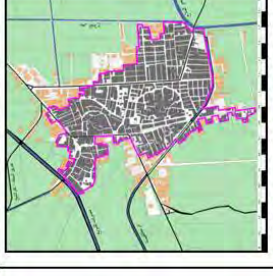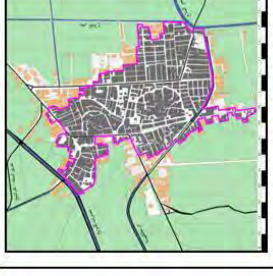
Gharbia Governorate - Markaz ElMahala ElKobra
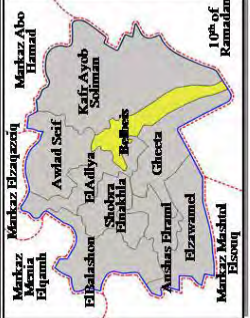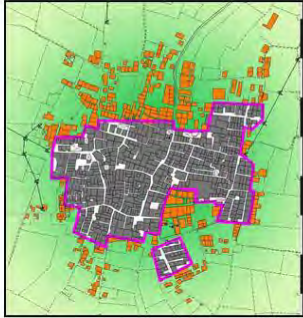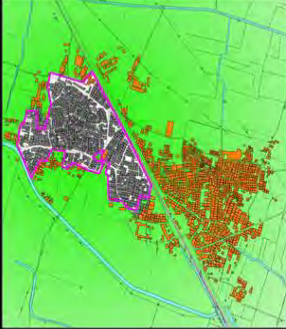
Village	Area 1985	Area 2003	Urban sprawl %
Saft Trab	107	194.3	%81.6
Shobra Babel	119	193	%62.2
ElHayatem	140.86	234.23	%66.3
Mahalet Abo Ali Elqantara	138	255	%84.8
ElAmerya	124	206	%66.1
Mahalet Hassan	121	158	%30.6
ElMoatamedya	101	131	%29.7
Beshbeish	220	389.3	%77.0
Damro ElSadat	140	218	%55.7
ElShaheidy	45	95	%111.1
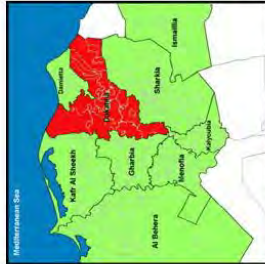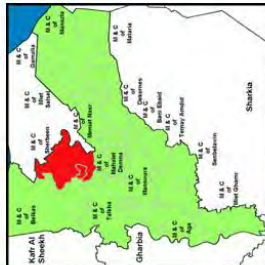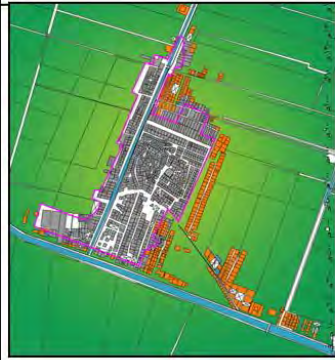
The boundaries of the administrative units & the city of the Markaz

Gharbia Governorate

Markaz ElMahala ElKobra

Saft Trab

Shobra Babel

ElHayatem

Mahalet Abo Ali Elqantara

ElAmerya

Mahalet Hassan

ElMoatamedya

Beshbeish

Damro ElSadat

ElShaheidy

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Gharbia Governorate - Markaz Basion

Village	Area 1985 (feddan) inside the physical demarcation	Total area (feddan) 2003	Urban sprawl % outside the physical demarcation
Sa ElHagar	118	162	%37.3
Kafr ElMonshea Abo Honmor	58	96	%65.5
Kotama ElGhaba	77	176.5	%129.2
Qransho	63	226.5	%259.5

The boundaries of the administrative units & the city of the Markaz

Qransho

Kotama ElGhaba

Markaz Basion

Kafr ElMonshea Abo Homor

Gharbia Governorate

Sa ElHagar

Sharqia Governorate - Markaz Belbeis

Village	Area 1985	Area 2003	Urban sprawl%
ElAdlya	45	65.8	%46.2
ElBalashon	73	116	%58.9
Shobra Elnakhla	115	148.3	%29.0
Awlad Seif	30	57.88	%92.9
Elzawamel	37	44.3	%19.7
Gheeda	41	62.23	%51.8
Anshas Elraml	53.78	79.67	%48.1
Kafr Ayob Soliman	23	66	%187.0

The boundaries of the administrative units & the city of the Markaz

Sharqia Governorate

Markaz Belbeis

Awlad Seif

Kafr Ayob Soliman

Shobra Elnakhla

Anshas Elraml

ElAdlya

ElBalashon

Gheeta

Elzawamel

Daqahlia Governorate - Markaz Sherbein

Village	Area 1985	Area 2003	Urban sprawl%
Kafr Elwekala	54	77.47	%43.5
Kafr ElAtrash	52	90.05	%73.2
Kafr Elhag Sherbeini	45	107.8	%139.6
Raas Elkhaleig	109	130.2	%19.4
Kafr Elteraa Elqadeim	53	83	%56.6
Bosat Kareim Eldein	43	73.82	%71.7
Elhesas	17	27.95	%64.4

The boundaries of the administrative units & the city of the Markaz

Daqahlia Governorate

Markaz Sherbein

Kafr Elwekala

Kafr ElAtrash

Kafr Elhag Sherbeini

Raas Elkhaleig

Kafr Elteraa Elqadeim

Bosat Kareim Eldein

Elhesas

Appendix (C): Questionnaire form conducted through the structured interviews of the National Project for Preparing the Strategic Development Plans for Egyptian Villages

No.	Subject
**Study of the rural sector issues**	
Background	
	Basic information
1	What is the area of the village (zimam) (from ten years and now)?
2	What are the current population size and the population growth rate (during the past ten years)?
3	Who are the main families in the village?
1	*Local Governance Development*
	Previous administrative development programs
1	What were the administrative development programs that took place in the village? And what are the strength / weakness points (organization, training, information, etc.)
	The institutional framework of the local governance
2	Preparation of a statement of the administrations of the local unit (the administration, number of employees – type: executive, technician, service,…).
3	Are there party headquarters in the village or the local unit? What parties do they follow?
4	What are the operational NGOs in the village?
	Execution means by the local administration
5	What are the main sources of local income and sovereign concern of the local administration / the NGOs? (Selling / purchasing lands, consumption expenditures and construction licenses, workers' wages, etc.?
6	What are the financial problems that face the local administration / the NGOs? (For example: inability of facilities' maintenance, etc.)
7	What are the services that the local administration / the NGOs execute? Is there a decrease or lack in these services?
8	How could organizing and controlling take place in monitoring the services' provision?
9	What are the problems (the most significant issues) of the local administration**?**

	The local administration role in development- :
10	What were the previous efforts for developing the village? Who are the participating authorities? What are the strength/weakness points in these efforts?
11	Did the local authority identify the priorities of the village development (concerning: services, income generation activities, etc.)? How were these priorities determined?
12	Are there any civil organizations working in the village ? If so, what are the fields of their work (education, health, environment / small industries, loans)?
13	What is the current type of cooperation between the local administration, the NGOs, the civil organization and the private sector? How does the coordination take place?
14	How does the collection of money to support public services in the village take place?
15	What are your suggestions of the activities that support the village development in the local governance field? And what is the kind and size of contribution that you can offer to accomplish these activities?
2	**Urban Development**
	Previous urban programs
1	Where do lands that are built on or prepared for construction in the previous period fall? What is their type of ownership?
	Land
2	Are there any plans that prepared for the village?
3	What did the local unit carry out for the development of the village during the last two years (development control, specification of the construction conditions, roads maintenance, construction of markets, etc.)?
4	What are the problems of controlling the urban extension of the village (registration, maps, non clear limits, non known ownerships, etc)? And how does the solution of these problems be possible?
5	What are the reasons that lead to the selling of agricultural land?
6	What are the reasons that lead to construction on agricultural land?
7	How does the local administration prevent aggression on the agricultural land? And what are your suggestions in this field?

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8	Where is the suitable land for construction? What are their characteristics?
	Housing
9	How does getting residence take place? What are the tenure types?
10	What are the reasons for the high building prices in the village?
11	What are the reasons for building houses on new lands? What are the circumstances around building on the agricultural land?
12	At the vertical condensation, will the original building be destroyed or raised? And why?
13	What is the ownership / rent ratio of houses in the village?
14	Is there housing in any precarious sites (high polluted areas, too close to high tension electric cables, etc…) in the village? What is the ratio of population who live in these sites?
15	Are there organizations giving assistance (financial and technical) to women headed households or other vulnerable groups to get dwellings?
	Services and Infrastructure
16	How does provision with infrastructure take place? And what are the conditions for this? What is the cost of getting potable water, sanitary drainage and garbage collection?
17	What are the citizens' ratios who have access to potable water for drinking? And the citizens' ratio who have this access in their houses?
18	How good is the water supply service (bad, average, good)? And what are the problems (discontinuity, colored, odor, etc…)?
19	What are the citizens' ratios who have access to an improved sewerage service (getting rid of the residues by certain system not manual)? What are the system elements (drainage vehicle, network, treatment station)?
20	What is the sewerage service level (bad, average or good)? And what are the problems (discontinuity, lag, overflow, etc…)?
21	How good is the electricity supply service (bad, average or good)? And what are the problems (discontinuity, etc…)?
22	What are the citizens' ratios who supplied with electricity service? What are the system elements (network, power plant)? And what are the other energy resources?
23	How good is the garbage collection service (bad, average or

	good)? And what are the problems (non regularity of service, thrown in a non suitable place, etc.)?
24	How good is the education service (bad, average or good)? And what are the problems (insufficient classes, high students' density, far distance, bad structural condition, etc.)?
25	How good is the health service (bad, average or good)? And what are the problems (non proportionality with the need, the non regularity of the service, far distance, etc.)?
26	Are any of the services or facilities offered by the private sector? And what is the service level (bad, average or good) and its cost?
27	What are the services offered by the NGOs, the civil organizations or the private sector in the village?
28	What are the urgent services / emergencies that the village depends on and gets from the region?
	Activities and Urban Development Projects
29	What are your suggestions of the activities that support village development in the urban development field? And what is the kind / size of the contribution that you can offer to accomplish these activities ?
30	What is the available location for the establishment of this activity ?And what are the allocation constraints from your point of view and the means of dealing with them?

3	**_Economic Development_**
	Previous economic programs
1	What were the economic development programs that took place in the village ?And what are the strength / weakness points?
	Issues, visions, goals and activities
2	What are the main economic issues in the village (Production, labour, income, etc.)?What are the issue dimensions ?And what is the causative activity?
3	What can be done in response to these issues (each issue) and what is the role of each stakeholder (local administration, the local council, the NGOs or the civil one, private sector, the governor or a person with ability and the Ministries? What are the activities that could possibly take place now to increase the efficiency or the effectiveness of the economic activities?
4	What is the benefit and who are the beneficiaries and how will the

	benefiting prevail over the others?
5	What is the goal of this activity (examples of goals: poverty reduction, reduction of income disparities, the increase in investment and job opportunities, the expansion in the local trade and preserving local jobs, preserving wealth locally, the increase of the economic balance, the increase of self dependence, supporting the economy with the different sectors?
6	What is the long run impact of this activity on the village or the region?
	Commercial / industrial economic enterprises
7	What is the main activity that the village people perform (farmers, handicraft workers, fishers, etc.)? What are the secondary or other works in the village?
8	What are the service enterprises in the village that the village residents depend on for the completion of their work and activities (society, mechanization, guidance, etc.)? What is the extent of their efficiency in servicing the village?
9	What are the commercial enterprises in the village (bank, crops marketing, real estates, industries, seeds production companies, etc.)? What is the supreme one?
10	What are the industrial enterprises (agricultural, service, real-estate, industrial, etc.) in the village? What is the supreme one?
11	What are the informal economic activities in the village?
	Economic links
12	Does your village depend on or have a strong connection with other urban settlements in the region (for example: markets, an industrial area, etc.)? Are there any obstacles in the contact / interaction with these settlements?
13	When does the money leave the local unit? For purchasing what? Do citizens travel to work?
	Population
14	What is the ratio of residents who work outside the village?
	Where do the residents who work outside the village work?
15	What is the agricultural lands ratio that owned to the non – residents in the village?
16	What is the ratio of residents who possess agricultural lands?
	Resources and Agriculture

17	What are the natural resources in the village (land, water, air)?
18	How does the retailing of the main crops take place (cotton, wheat, corn, rice)?
19	What are the agricultural production inputs (feed, seeds, etc...) and their prices that the farmer or the worker pays?
20	What are the incentives that encourage the combination of the small areas of agricultural lands to each other? What do you suggest as an incentive?
	Financial mechanisms
21	What can be done to encourage investment in the village?
22	How is it possible to get a loan? What are the required guarantees for getting loans? What is the ratio of the capable citizens to fulfill the required conditions?
23	What are the informal means for getting emergency financial support?
24	What is the mechanism that enables the collection of money for the payment of a public service?
25	What are the fees or the local and sovereign taxes that the village people pay?
26	What are the real-estate taxes (quantity, area, borders, and exceptions)?
	Attitudes of the poor and the marginalized ones
27	Is there any support that the poor get to circumvent life hardships? From whom?
28	What are the roles that the NGOs, the village's organizations, the private sector and the other local partners play in response to the problems of the poor?
Activities and economic development projects	
29	What are your suggestions of the activities that support the development of the village in the local economy field ?And what is the kind / size of the contribution that you can offer to accomplish these activities?
30	What is the available location for the establishment of this activity ? And what are the allocation constraints from your point of view and the means of dealing with them?

4	*Social Development*
	Background
1	What were the social improvement programs that took place in the village? And what are the strength / weakness points?
	Issues, visions, goals and activities
2	What are the main social issues that concern the village (the local unit) for example: unemployment, vagrancy, poverty, crime, violence, children labor, etc) ?
3	What can be done in response to these issues (each issue) and what is the role of each stakeholder (local administration, the local council, the NGOs or the civil one, private sector, the governor or a person with ability and the Ministries? What are the activities that could possibly take place now to increase the efficiency or the effectiveness of the service?
4	What is the benefit and who are the beneficiaries and how will the benefiting prevail over the others?
5	What is the goal of these activities (examples of goals: illiteracy reduction, health improvement, increase in services, the improvement of the service level, equal opportunities in getting the service, etc..)
6	What is the long term impact of this activity in the village or the region?
	Responsibilities and institutional support
7	What are the endemic diseases in the village and where do the therapeutic centers of these diseases fall?
8	What are the categories that have health insurance and what is the ratio of the deprived categories in the village?
9	What is the actual treatment cost of those diseases? Are there any authorities (governmental /non-governmental) that support the treatment of the poor category?
10	What is the kind of spread crimes in the village? (Violence, drugs, theft, etc…). What is their reason in your opinion? What are the most exposed areas for crime? And why?
11	What is the current style of the crime fighting? Is it effective? And what are your suggestions in this field?
12	What is ratio of families with women headed households?
13	What are the authorities that foster those families? What is the kind / size of the aid for them?

14	What are the obstacles that face those families to get this aid?
	Activities and Social Development Projects
15	What are your suggestions of the activities that support the development of the village in the social development field ?And what is the kind / size of the contribution that you can offer to accomplish these activities ?
16	Where are the available locations for the establishment of this activity ? And what are the allocation constraints from your point of view and the means of dealing with them?

5	**The Environment**
	Previous environmental programs
1	What are the environmental improvement programs that took place in the village? And what are the strength / weakness points? What is the role that each of the participants played (the local administration, the elected leaders, the civil society and the private sector?
	Issues, visions, goals and activities
2	What are the main environmental issues that encounter the village? (Solid and liquid wastes management, disposal of dead animals, water pollution by detergents, the stagnant drainages, etc.). What are the issue dimensions ?And what is the causative activity?
3	What can be done in response to these issues (each issue) and what is the role of each stakeholder (local administration, the local council, the NGOs or the civil one, private sector, the governor or a person with ability and the Ministries? What are the activities that could possibly take place now to increase the efficiency or the effectiveness of preserving the environment?
4	What are the benefits and who are the beneficiaries and how will the benefiting prevail over the others?
5	What is the goal of each proposed activity (protection of natural resources, reduction of pollution, and improvement of the resource kind, increase the efficiency of the solid wastes management)?
6	What is the long term impact of this activity on the village or the region?
	Pollution
7	Are there any environmental risks (landslides, earthquakes,

	industrial risks, etc…) facing the village citizens?
8	Are there air / water or land pollution ? What are the development sectors that contribute to increasing pollution? Define their sites.
9	What are your suggestions for cooperation to respond to the environmental issues?
	Projects and activities of environmental development
10	What are your suggestions of the activities that support the development of the village in the environment field ?And what is the kind / size of the contribution that you can offer to accomplish these activities?
11	Where is the available location for the establishment of this activity? And what are the allocation constraints from your point of view and the means of dealing with them?

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