Environ Dev Sustain (2009) 11:1175–1196
DOI 10.1007/s10668-008-9173-0

Monitoring and guiding development in rural Egypt: local sustainable development indicators and local Human Development Indices

Marwa A. Khalifa · Stephen Connelly

Received: 19 May 2008 / Accepted: 9 October 2008 / Published online: 25 October 2008

Abstract This paper puts forward sustainable development indicators and an index appropriate for monitoring and guiding development planning in the villages of rural Egypt, as an improvement on the current approach which is informed by locally calculated Human Development Indices (HDI). This has two principal weaknesses. Firstly many of the issues of importance to villagers are not covered by the economic and social scope of the HDI. Secondly the HDI, along with international sustainable development indicator sets, fails to identify problems which are of importance in specific national or sub-national contexts. We have therefore worked from a simplified but holistic model of the socio-economic-environmental system of a rural Egyptian village, informed by the outputs of a participatory planning process. An indicator set based on a one-to-one correspondence between system components and indicators was created. This comprehensive set is detailed but consequently rather unwieldy, and a core set is selected and compared with the HDI indicators for a sample of villages to demonstrate the impact of considering environmental and institutional factors on establishing priority areas for government intervention. We conclude that a combination of a locally relevant index and an easily comprehended diagrammatic approach to presenting a small indicator set offers advantages to decision makers in comparison to local application of the HDI.

Keywords Human Development Index · Sustainable development indicators · Systems thinking · Rural Egypt

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M. A. Khalifa
Department of Urban Planning and Design, Faculty of Engineering,
Ain Shams University, Cairo, Egypt

S. Connelly (✉)
Department of Town and Regional Planning, University of Sheffield,
Sheffield S10 2TN, UK
e-mail: s.connelly@sheffield.ac.uk

1 Introduction

The need to monitor and measure progress in 'development' has led to a proliferation of indicators since the concept was given its modern meaning in the period following the Second World War. As the concept itself developed, gross domestic product (GDP) as the standard economic indicator of a nation's level of development was joined in the 1990s first by the United Nations' Human Development Index (HDI) and then by a range of indicators and indices intended to measure the emerging notion of 'sustainable development'. In contrast to the enduring dominance of GDP and the now-established importance of the HDI in the field of international development assistance, no single sustainability index or set of sustainable development indicators has achieved universal acceptance (Wilson et al. 2007). This reflects to some extent the independent development of indicators to meet local contexts and priorities, as well as the continuing and perhaps unavoidable lack of consensus over the substantive, practical meaning of 'sustainable development' (Connelly 2007; Wilson et al. 2007). At one level this is unproblematic and even desirable, given the varying nature of the challenges to sustainable development in different places. However, it can also present problems for planning for sustainable development. The dominance of the economic indicator in the common understanding of 'development' has been seen as a barrier to promoting social and environmental goals (Dipietro and Anoruo 2006). Similarly the existence of the HDI as a simple measure backed by the powerful UN system does not assist the inclusion of environmental concerns in development policies, particularly in countries of the global South for whom international development assistance is a significant source of income. Moreover, sustainable development indicators and the data collection systems to support them have yet to be developed in many countries (Bell and Morse 2001; Abolina and Zilans 2002).

This situation is the point of departure for this paper, which sets out a proposal for a set of sustainable development indicators and a composite index for the rural villages of the Nile Delta in Egypt, home to about a third of Egypt's population of around 72 million.[1] Sub-national HDIs have increasing significance in development planning within Egypt. With government policy aligned with international priorities to address the Millennium Development Goals (MDGs), some resources are targeted and progress monitored through the Index (see, for example, UNDP 2008). In contrast, it is only recently that the government has taken steps towards creating a national set of sustainable development indicators and the data collation infrastructure to support them (Ebrahim 2005). Given the nature of the HDIs, there is a risk that environmental and institutional dimensions of development will be neglected,[2] in particular two major problems besetting rural Egypt—the continuous loss of agricultural land to haphazard settlement growth and inflexibility in allocation of resources and other administrative functions at local level (UNDP/INP 2004).

The indicators and index set out here are therefore based on a holistic (albeit necessarily simplified) model of a rural Egyptian village, encompassing the components of the rural system across social, economic, environmental, urban and institutional dimensions. The development of the model was informed by the outputs of a participatory planning process.

[1] Population figures can only be approximate, particularly given the rapid rate of population growth (1.7% per annum, (CIA 2008). The 2006 national census gave a total population of 72.1 million (CAPMAS 2007), while the most recent CIA *World Fact Book* gives a mid-year 2008 estimate of 81.7 million (CIA 2008). The 2006 census figures are used in this paper.

[2] The pursuit of the MDGs hardly reduces this bias. Although MDG 7 is to 'ensure environmental sustainability', the only quantified *goal* it contains is to halve the population without access to safe drinking water (UN 2007).

The remainder of the paper is divided into two principal parts. The first includes brief discussions of the HDI and existing indices of sustainable development, and of the issues raised by the use of indicator sets and/or single composite indices. It then sets out the rationales for adopting a systems-based approach to developing indicators and for a degree of lay involvement in the process. The second part sets out the process of developing the village indicators and index. Having introduced the physical and institutional context, the planning process that led to the design of the model is described. The components of this model formed the basis for an initial, comprehensive set of indicators, from which a smaller core set was selected, the indicators of which in turn were used as the components of the sustainability index. In the final section these indicators and index are used to rank a sample set of villages, and compared with the ranks produced by the HDI.

We conclude that a combination of a locally relevant index and an easily comprehended diagrammatic approach to presenting a small indicator set offers advantages to decision makers in comparison to local application of the HDI.

2 Indicators for 'development'

Indicators function by simplifying complex phenomena and information into quantifiable measures that can be readily communicated. As Abolina and Zilans put it:

> *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: 307).

They are by necessity selective in terms of the information that they provide and partial in the understanding they can convey of the phenomena that they indicate. Given this, the challenge is to devise indicators for which this selectivity is more helpful than not—a balance which is clearly purpose specific. Achieving this can be problematic, however, given the multi-purpose nature of many indicators. As guidance for decision makers they can in principle assist in highlighting problems, measuring progress, evaluating policy and performance management (Hardi and Zdan 1997; UNCSD 2001). They have also been seen as important tools to communicate ideas, thoughts and values (UNCSD 2001), although this developmental and educational role can conflict with the technical role as guides for policy making (Brugmann 1997). Further, indicators' roles can extend beyond their originally intended purposes—as, for example, GDP became a 'measure' of national standard of living as well as of one aspect of a nation's economy (Dipietro and Anoruo 2006).

Similar issues arise in relation to the size of an indicator set. Reflecting real-world complexity is traded off against comprehensibility and ease of use, with pressures towards smaller sets to guide non-specialist decision makers and the public. Reduction in numbers is achieved either through more rigorous selection or through combination, with the extreme being the creation of single composite indices. These are attractively simple, enabling comparison between countries, cities or regions and easy communication of progress (or its reverse) to a wide range of audiences. However, such indices carry serious risks as measures of progress in complex fields, due to their inbuilt propensity to 'compensability' (Munda 2005). This refers to the possibility of trading off a poor result in one component against a positive result in another. For example, in a sustainability index, economic growth can compensate for environmental destruction, while within a compound environmental quality indicator, clean air could compensate for a loss of potable water. Reducing the number of indicators in order to increase comprehensibility thus gives rise to three interlinked

limitations: loss of detail, risk of unbalanced representation of significant factors and obscuring negative aspects through compensability.

Globally, the UN's Human Development Index has become a widely accepted measure of 'development'. It was introduced by the United Nations Development Programme (UNDP) in 1990 as a composite indicator which would more fully reflect the dimensions of a conception of development which recognised its fundamentally human nature (UNDP 1990). This explicitly recognised weaknesses in GDP as the principal development indicator, on the grounds that it was not helpful in understanding the differences between countries' development or for explaining the obstacles to achieving human development. The HDI is composed of sub-indices which represent achievements in three 'essential elements of human life': longevity, knowledge and decent living standards (UNDP 1990: 12). These are, respectively, associated with quantified indicators of health, education and income.[3]

The international ascendance of sustainable development as a policy goal since 1992 has stimulated a parallel development of measures to assess progress towards sustainability (Wilson et al. 2007). While there has been strikingly little consensus over what would constitute an appropriate index or indicators, desirable characteristics of sustainable development indicators (SDIs) have been elaborated. Maclaren set out an early definition:

> *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).

With the exception of Maclaren's concern with distributional justice, similar criteria are widely accepted.[4] SDIs need to inform policy, and reflect both the breadth of the concerns encompassed by the concept of 'sustainable development' and the fact that these are interlinked (Anastacio et al. 2000). Reflecting the tenor of Agenda 21, most of those involved in indicator development would also subscribe to the idea that they should be developed together with at least some stakeholders, though the balance sought between the roles of expert, policy-maker and 'general public' varies considerably (Reed et al. 2006).

[3] These indicators are: life expectancy at birth (in years); a combination of adult literacy as a percentage and educational enrolment (as a percentage across primary, secondary and tertiary sectors); and the logarithm of purchasing-power-adjusted GDP per capita (in US$). 'Dimensional' indices are constructed for each indicator by positioning its value for a country or other administrative entity on a scale between defined 'goalposts' (25 and 85 years for life expectancy, US$100 and $40000 for GDP and so on) at a point calculated as:

$$\frac{\text{Actualvalue} - \text{Minimumvalue}}{\text{Maximumvalue} - \text{Minimumvalue}}$$

All values thus lie on a scale between 0 and 1. The total HDI is then the unweighted arithmetic mean of the three sub-indices, the educational sub-index being the weighted mean (2/3 adult literacy index +1/3 gross enrolment index). (UNDP 2007).

When the index was launched, the use of income as proxy for 'decent living standards' was deprecated by the report's own authors, who reluctantly accepted that data problems necessitated 'for the time being making the best use of an income indicator' (UNDP 1990: 12). Eighteen years later the same indicator is still in use.

[4] All indicators and their underlying definitions of development embody normative positions. The essentially contested nature of the concept of sustainable development is beyond the remit of this paper (see Jacobs 1999; Connelly 2007). Suffice it to say that despite the inescapable disputes over exactly what 'counts as' sustainable development, there is an agreed 'first level' definition encapsulated in the Brundtland Report's 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987: 43). Criteria for indicators of the kind suggested by Maclaren follow fairly naturally from this.

However, the development of indicators which adequately reflect the linkages between different components of sustainable development has been relatively weak. Two broad approaches have been taken. The first has been the selection of indicators which in themselves embody the linkages, for instance through the use of ratios between measures which indicate some kind of 'environmental efficiency'. This approach is evident in some of the more widely used indices, such as 'ecological' or 'carbon footprints' (Wackernagel and Rees 1996; Wiedmann and Minx 2007) which draw together wide swathes of human activity and link them to their environmental resource impacts. However, within indicator sets this approach appears to be far less common and many prominent examples are still dominated by single-issue rather than linked indicators .[5] These include national sets such as those of the UK (DETR 1999; Levett 1999; DEFRA 2007) and international ones, such as those of the UN Commission for Sustainable Development (UNCSD 2001), which recognises the weaknesses of its own system: 'indicator sets such as the CSD indicators track progress but may require some additional information to make their integrative nature more explicit' (UNCSD 2007: 14–15). The second approach addresses the integration issue through linkages between indicators rather than within individual indicators. This is a long-standing and well-recognised approach in principle, with several well-known frameworks in use which group indicators through short, purportedly causal, chains: the Pressure-State-Response framework and its derivatives (see Segnestam 2002 for a useful review, and Niemeijer and de Groot 2008 for a critical view of the adoption of these frameworks in practice.)

Intuitively obvious and attractive, though rare in practice, is the extension of these frameworks to one rooted in a holistic systems-approach analysis. This involves modelling the entirety of the system of interest, with an understanding of the linkages in the model as causal, and then establishing a set of indicators which track the major elements of the system (Bossel 2001). This approach appears to be gaining in popularity, with a number of separate groups working independently in similar ways. While it is inevitably complicated and difficult in practice, reports by Tippett et al. (2007), and Niemeijer and de Groot (2008) and the work of Mark Reed and his collaborators (Fraser et al. 2006; Reed et al. 2006) demonstrate its feasibility and potential. The work presented here has emerged from another of these parallel development processes.

The question of 'who devises such a model and indicators?' immediately arises. There is widespread recognition that for indicators to be useable there must be some involvement of the users in defining them. Who these should be and the nature of their role have been the source of considerable debate, with two broad camps identifiable, respectively espousing a 'top-down', expert-led approach and a 'bottom-up', participatory approach (Bell and Morse 2001; Reed et al. 2006). The primary ground of difference between these is over whether scientific expertise should dominate the process of defining what 'sustainable development' might entail (emphasising the 'objectivity' of environmental limits) or whether 'subjective' quality of life issues are central to any conception of development. However, effective indicators must satisfy the twin criteria of measuring progress towards sustainability (suggesting at least some expert involvement) *and* communicating that progress (requiring acceptance by stakeholders) (Reed et al. 2006). There are thus strong pragmatic grounds for setting aside underlying philosophical conflicts and merging the two approaches—typically through processes of dialogue and social learning between experts and user groups (Bell and Morse 2001; Reed et al. 2006).

[5] Generalisations in this field are difficult, since there is an enormous the 'grey literature' of indicator sets.

Turning now to the context of developing a sustainable development indicator set for rural Egypt, the preceding arguments together suggest an 'ideal' process of scientists and a range of stakeholder groups working together to develop a holistic model of a village system and a set of indicators which can identify and track key sustainability challenges in a rigorous yet comprehensible way. The remainder of the paper reports on the attempt to carry out this task.

3 Developing sustainable development indicators for the villages of Lower Egypt

3.1 The context: rural Egypt

The total land area of Egypt is about one million square kilometres,[6] of which only about 3.5% is cultivated, principally in the densely populated Nile Valley and Delta (CIA 2008). The Delta—Lower Egypt—comprises the largest area of agricultural land, and has a rural population of about 23 million (CAPMAS 2007). Population growth is rapid, although the rate of increase has fallen considerably in recent years (UNDP/INP 2004). In rural areas some of this growth is off-set by substantial rural-urban migration, but much is also accommodated through spread of Egypt's villages and small towns. This constitutes a significant problem: housing and agriculture are largely confined to, and compete for, the same, very limited area, and unplanned urban growth is estimated to have consumed about a sixth of the country's traditional agricultural land in the past 20 years (UNDP/INP 2004).[7]

Assessed by its GDP, Egypt is categorised as a 'lower-middle-income' country (World Bank 2008), and falls in a similar 'lower-middle' position in the world HDI rankings (112 out of 177 countries in 2005 (UNDP 2007)). However, this overall position masks considerable internal variation, with 'rural' governorates having substantially lower HDIs than their urban counterparts (UNDP/INP 2005), as shown in Table 1.[8] This reflects historical disadvantages in terms of government concern and flows of resources for development.

In terms of provision of services and basic infrastructure there are similar gaps, with the exception of mains electricity supply, which is almost universal throughout Egypt. In contrast, the lack of adequate sanitary sewage system for the vast majority of Egyptian villages represents a serious problem, as does the number of villages still without water supplies of adequate quality (UNDP, ORDEV and MOLD 2003; UNDP/INP 2005).

Addressing these problems has been hindered by Egypt's governance structures. The state is extremely centralised, with policy and decision-making powers concentrated in the

[6] Egypt is thus approximately four times the size of the United Kingdom, and slightly more than three times the size of New Mexico (CIA 2008).

[7] At a national level this loss is to some extent offset by the opening of 'new lands' through irrigation in the Western desert. At a local level, however, there is a straightforward trade-off between urban growth and farmland loss, except where settlements can expand into the desert beyond the boundary of irrigated agricultural land. This is not possible across most of the Delta, where most villages are surrounded by agricultural land.

[8] Egypt's 27 governorates are the highest level sub-national administrative units. Four are classified as 'urban' (Cairo, Alexandria, Port Said and Suez), while the remainder are a mixture of rural and urban areas. The comparison between urban and other governorates does not capture precisely the distinction between urban and rural areas, but the data presented here and the supporting text of successive HDI reports make it clear that the rural population is substantially disadvantaged. In 2006, the population of the Lower Egyptian governorates was 73% rural, 27% urban.

Table 1 Egypt's HDI in 2004 (UNDP/INP, 2005)

	Egypt	Urban governorates	Lower Egyptian governorates	Upper Egyptian governorates
Human development index	0.689	0.766	0.685	0.657
• Life expectancy index	0.760	0.777	0.768	0.747
• Education index	0.685	0.801	0.680	0.620
• GDP index	0.622	0.722	0.607	0.605

capital, Cairo (UNDP/INP 2004). Partly as a consequence of the centralisation, development is further hindered by the lack of integration, and even contradiction, between the policies and actions of different central organisations (UNDP/INP 2005). Reforming governance has become a stated priority of the government, with the support of the international community. Since the turn of the millennium there have been experiments in fiscal decentralisation, with increasing financial decision-making and spending power being devolved to governorate level (UNDP/INP 2004; MOED 2006). It is in this context that the development of sub-national HDIs has started to become important as a guide to directing governmental resources on the basis of assessed local needs (UNDP, ORDEV and MOLD 2003). Moreover, within UN-funded development projects the HDIs are used as basic indicators by which outcomes are assessed (see, for example, UNDP 2008).

However, as a tool for guiding policy in the context of rural Egypt—and perhaps elsewhere—the Index clearly suffers from all three of the limitations noted above. While the complexity of the development issues in villages and small towns cannot be captured by *any* four measures, it is perhaps more problematic that the HDI's focus on health, education and income neglects both specifically environmental issues and institutional factors which may well have a bearing on development.

Pollution of both water and air is a significant problem, with groundwater in many rural areas contaminated due to the lack of adequate sanitary system and the consequent mixing of sewage with groundwater, as well as contamination by discharge of domestic, agricultural and industrial waste. Air quality is affected by unregulated burning of domestic and agricultural waste, as well as by industrial emissions and increasing (though localised) problems of traffic pollution (UNDP/INP 2005; CIA 2008). As noted above, the Delta is significantly affected by the loss of agricultural land to settlement, which has both economic consequences and more 'environmental' results such as loss of habitats. The economic viability of traditional farming is also negatively affected by the phenomenon of tiny landholdings, which are considered an obstacle to applying efficient agricultural (and especially irrigation) cycles. Productivity and income are low.

It is thus clear that at the village level there are substantial and enduring problems which go beyond those captured by the components of the HDI. Over the past few years, however, some progress has been made in narrowing the rural/urban gap in health and education and infrastructure (UNDP/INP 2004). This has been at least in part the result of a series of programmes aimed at tackling rural disadvantage and under-development, which since the mid-1990s have taken steps towards more holistic and participatory approaches (UNDP/INP 2003). The focus of this paper is a major initiative by the Ministry of Housing, Utilities & Urban Communities' General Organization of Physical Planning (GOPP), which has been preparing strategic plans for villages all over Egypt, addressing a wide range of environmental as well as social and economic issues since 2002 (GOPP 2002). In 2005, this programme adopted a participatory planning methodology for preparing these

plans, drawing on the organisation's previous experience in urban areas (Hassan et al. 2006) and in collaborative work with the Ministry of Local Development (GOPP 2005).

Overall, three changes in policy processes for rural Egypt have been happening simultaneously in the first few years of the twenty-first century: a broadening of stakeholder involvement, including public participation; a broadening of development concerns to embrace the concept of sustainability; and fiscal decentralisation accompanied by a more needs-based approach to government spending. Yet, the latter process is guided by the HDIs, and the planning processes are unsupported by indicators reflecting the breadth of their concerns. It is in this context that developing an effective set of sustainable development indicators becomes a priority.

In the remainder of the paper, we develop an indicator set and a single sustainability index which we suggest can be used to inform development of villages in rural Lower Egypt, drawing on one of the author's involvement in the GOPP's participatory rural planning programme noted above (GOPP 2005). Following Bossel (2001), we first establish a model of the processes at work in a typical village which identifies key elements of the systems and interrelationships between them. This was largely informed by the GOPP work and involved substantial input from stakeholders.[9] While we recognise the importance of such input, and subscribe in principle to the approach of Reed and others referred to above (Reed et al. 2006, etc.), the practicalities of the situation in terms of resources and access to the villages meant that the project fell short of this ideal. Stakeholders were thus only engaged in this first, conceptual development stage, to which they contributed by identifying their key issues of concern, problems and priorities for development. Bossel's second stage is the definition of indicators which correspond to these system elements. This goes beyond the remit of the GOPP work and was carried out entirely by the authors as a separate project, without further stakeholder input. The indicators we propose are thus put forward somewhat tentatively, but they do, in our view, represent a credible first approximation at a viable indicator set, which we moreover demonstrate has advantages over the current usage of the HDI.

The problem raised by the varying needs of policy makers who work at different scales and degrees of detail is addressed here by developing nested sets of indicators. Starting with a full, comprehensive set corresponding to the elements in the model, we define a more manageable 'core' set, which we then illustrate for a sample of villages. This requires pragmatic adjustments to the core indicators, to create a 'provisional' set for which data are currently available. Finally the indicators are aggregated to create a single composite 'sustainability index' for the villages—possibly the most effective approach for communication but the bluntest planning tool.

3.2 Stage 1: developing the model

The model is based on data taken from the GOPP field work. Following a pilot in a single village, consultants recruited from universities and other Egyptian research organisations carried out surveys in 497 villages in the period from April to September 2005—the so-called 'urgent phase' of the project. From these a random sample of 14 villages was selected from governorates across Lower Egypt to provide data for the model. While emphases differed, the main issues of concern expressed by stakeholders were similar

[9] While by current standards of international development the GOPP work is not very 'participatory', within the context of Egypt's highly centralised and authoritarian state it is a significant departure from past practice, and one which challenges both implementers and participants.

enough to enable the creation of a robust model—only in the specific priorities for projects were there significant differences between localities.

Collection of data took place in two stages. Interviews based on a standard questionnaire were carried out with representatives of stakeholder groups in each village. These groups were: local (state) government, the private sector, locally active non-governmental organisations (NGOs), local popular council and the community (including local leaders and representatives from organised groups in the village). The questionnaire was organised to cover five main themes: the three key dimensions of sustainable development (economic development, social development and the environment) together with local governance and urban development. The latter two were added due to the current importance of decentralisation and GOPP's interest in the issue of the spread of the villages' dense urban environment onto surrounding agricultural land. Within these themes the questionnaire principally used open questions, designed to generate answers within standard categories while leaving respondents free to express their own perceptions of what they perceive as problems, constraints or opportunities and leaving open the door for further clarification of their perception of the situation in their villages. The results of the questionnaire were presented back to group meetings in each village, which provided opportunities for the results to be probed, corroborated and supplemented as participants thought appropriate. The overall aim was to establish as far as possible an adequate and valid understanding for the researchers of the situation 'on the ground' and to specify the priority needs from the point of view of different stakeholders. Table 2 presents the composite results from the 14 village processes.

Based on these results a model was designed which was intended to capture both the key elements of the village system and the linkages between them. Many of these create feedback loops and complex interlinkages, reflecting the reality of a system in which simple, linear casual chains are probably both rare and hard to identify. The model was developed by us as researchers, outside the field setting. Although based on descriptions of the villages provided by stakeholders, it is inevitably subjective, in that the judgements about which are key elements, how exactly to characterise them and how they interlink were ours. Its robustness and validity were increased through explicit justification and explanation, subject to intense critical scrutiny within the team (Mason 2002), followed by verification by academics involved in the GOPP project but not in the indicators development work. It is necessarily an approximation in its representation of a very complex reality, which in its details in any case differs from village to village, but we are confident that it is an adequate representation for the task in hand. (Clearly it could have been made more detailed, but there comes a point where additional veracity is won at the cost of manageability.) Figure 1 shows the model, with issues grouped by theme.

3.3 Stage 2: developing the indicators

Initially a set of indicators was created based on the model, with a one-to-one correspondence between system components and indicators (67 in total). Where possible the indicators were selected from available sustainable development indicator sets such as the UNCSD (UNCSD 2001) and the US-SDI (USIWGSDI 1998) sets, while others were developed by the authors to relate to the issues identified as important within the Egyptian village context. This comprehensive set (Khalifa 2006) can be used to provide decision makers and planners with a holistic vision of the current status of a particular village, both to identify issues which need addressing and to monitor progress in tackling them. However, the large number of indicators is likely to be a hindrance to decision

Table 2 Key issues and objectives identified in the villages

Theme	Key issues	Main objectives
Local governance development	Urban management	• Providing local authorities with data management tools to support planning
		• Giving local authorities the right of regulatory enforcement
	Institutional constraints	• Resolving conflicts due to contradictions between laws/ regulations
		• Reducing unnecessary bureaucracy
	Financial resources	• Mobilising 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 housing
Economic development	Local economy	• Developing local economic resources
		• Stimulating investment opportunities
		• Increasing revenue from agricultural land
		• Reducing institutional constraints on access to credit
	Unemployment	• Creating additional job opportunities
		• Reducing the unemployment rate
Social development	Poverty	• Reducing the percentage of population categorised as poor
		• Improving incomes
	Health service conditions	• Improving the performance of the health services
		• Facilitating accessibility to specialised medical centres
	Health status	• Improving the general health status
		• Reducing the rate of patients suffering from endemic diseases
	Educational service conditions	• Improving education provision and achievement
		• Reducing class size (especially in primary schools)
		• Facilitating accessibility to secondary and technical schools
	Illiteracy	• Reducing the illiteracy rate (especially amongst women)
		• Reducing the percentage of pupils dropping out of school (especially girls)
	Educational attainment	• Increasing the level of educational attainment (especially female)
	Violence and crime	• Providing security and emergency services

Table 2 continued

Theme	Key issues	Main objectives
The Environment	Sanitary drainage	• Providing all village buildings with an adequate sanitary drainage system
	Waste disposal	• Providing a safe system for solid waste collection from the village
		• Providing a safe system for disposal of solid agricultural waste
		• Providing a safe system for discharging liquid industrial and agricultural wastes
	Environmental quality	• Protection of agricultural lands from unplanned building of houses
		• Purifying the water bodies in and around villages
		• Covering sewers
		• Improving the quality of potable water
		• Reducing impact of waste burning on air quality
	Risk exposure	• Ensuring protection from high tension electric cables in residential areas

makers at higher levels, particularly when comparison between large numbers of villages is involved.

Therefore, a ***core set*** of key indicators was selected on the basis of highlighting issues identified as being of particular importance, coupled with recognition of the strategic and pragmatic benefits of using indicators which are already understood by decision makers and to which resources are already devoted. It thus builds on the HDI, with the intention of supplementing it rather than challenging its new and rather shaky prominence in Egyptian planning. The issues highlighted by the HDI are clearly important, but it was equally clear from the stakeholder processes that many important issues and problems affecting the rural system are not captured by the HDI focus on the economic and social aspects of 'development'.

Further, in order to ensure that the core set did not lose the holistic quality of the model and the 'comprehensive' set, the selected indicators were chosen to represent issues across the five themes. This does, however, raise important questions about efficiency and effectiveness in a situation where some of the indicators are closely related and show strong statistical correlation. Arguably, all but one of any set of closely correlated indicators should be eliminated, as they carry within them the same information. However, while reducing the size of the set may increase its effectiveness by reducing the amount of information that policy makers—or other audiences—have to deal with, eliminating closely correlated indicators risks losing effectiveness in other ways. Three factors have therefore been taken into account. The communicative function of the indicator set means that some 'redundancy' is acceptable—the most obvious example being the closely related urban growth rate and agricultural land loss indicators. These communicate different messages, for different policy actors, one highlighting where growth rates have greatest implication for a range of issues (including the provision of services as well as loss of productive land), while the latter draws attention to the scale of loss of a key national

resource.[10] Further, the choice of core indicators has taken into consideration the issues which were prioritised by the various stakeholder groups, as *separate* issues, and to some extent 'expert' considerations of efficiency have to be tempered by the collaborative nature of the process. Finally, with the available data most correlations can only be provisional, particularly between very different indicators such as life expectancy and educational achievement. If they proved consistent over a much larger set of villages then elimination of redundant indicators would be more attractive, as long as the communicative function of the indicator set was not reduced. Similarly, indicators which have very similar values across the villages have been retained because they point to important issues, and their uniformity may well be a contingent aspect of this particular set of villages. We emphasise that the results here can only be indicative of the potential of a much fuller programme to develop sustainable development indicators.

A final criterion was that the core indicators should be *currently* measurable. While all the indicators are *in principle* measurable (or they would not have been selected as indicators!), some are clearly more realisable than others at present. This is not to say that data are in fact currently available for all the core indicators—simply that it could be obtained relatively easily. Based on these criteria, the 17 key representative indicators shown in Table 3 were selected. The four indicators in italics are those composing the HDI.

4 Illustration: using the indicators in *markaz* Shebein Elqanater

In this final section, we illustrate the use of the core set of indicators for a small sample of villages, and then consider the utility of this in comparison with both a new 'sustainable development index' and the HDI. For the purposes of illustration some amendment had to be made to the core set, since at the time of writing data were unavailable for three of the seventeen indicators.[11] Substitutes have been chosen to cover the same issues but with currently quantifiable indicators, also listed in Table 3, but we stress that if the proposed indicators were adopted the original core set, rather than the substitutes, would be preferred.

The indicators were determined for the eight 'mother' villages of the *markaz* of Shebein Elqanater in Qalyobia Governorate[12] (Fig. 2). An entire *markaz* was chosen in order to explore similarities and differences in the nature and level of the villages' problems and development, given that they share similar circumstances in terms of geographical location, natural environment and institutional organisation. There are considerable variations

[10] This connects to a wider issue about the creation of indicators which goes beyond the question of correlation. Creating indicators involves multiple decisions about *exactly* what information to present. As Briggs and Connelly (1998) point out, not only variable selection but choice of denominator is also crucial. Continuing with the example of loss of agricultural land, in Lower Egypt this is a major problem which needs to be highlighted. We have chosen to use absolute rates of loss (feddan/year), as this indicates places of particular concern in the context of an overall challenge to food production. As an alternative, loss rates could have been presented as proportions of village land totals (% of village land/year), which would draw attention to places facing local sustainability challenges but would obscure the contribution that they make to overall resource loss. Such choices, and the ensuing trade-offs of information foregone, are unavoidable and need to be made consciously and defensibly in terms of the purposes of the set. Of course, given the multi-purpose nature of most indicator sets, this process is unlikely to be straightforward or entirely satisfactory to every audience!

[11] Significantly all three are environmental, reflecting the current lack of such data in Egypt.

[12] *Markaz* (literally 'centre' in Arabic) are the administrative units into which governorates are divided. Each is composed of several 'mother' villages, each with smaller 'satellites'.

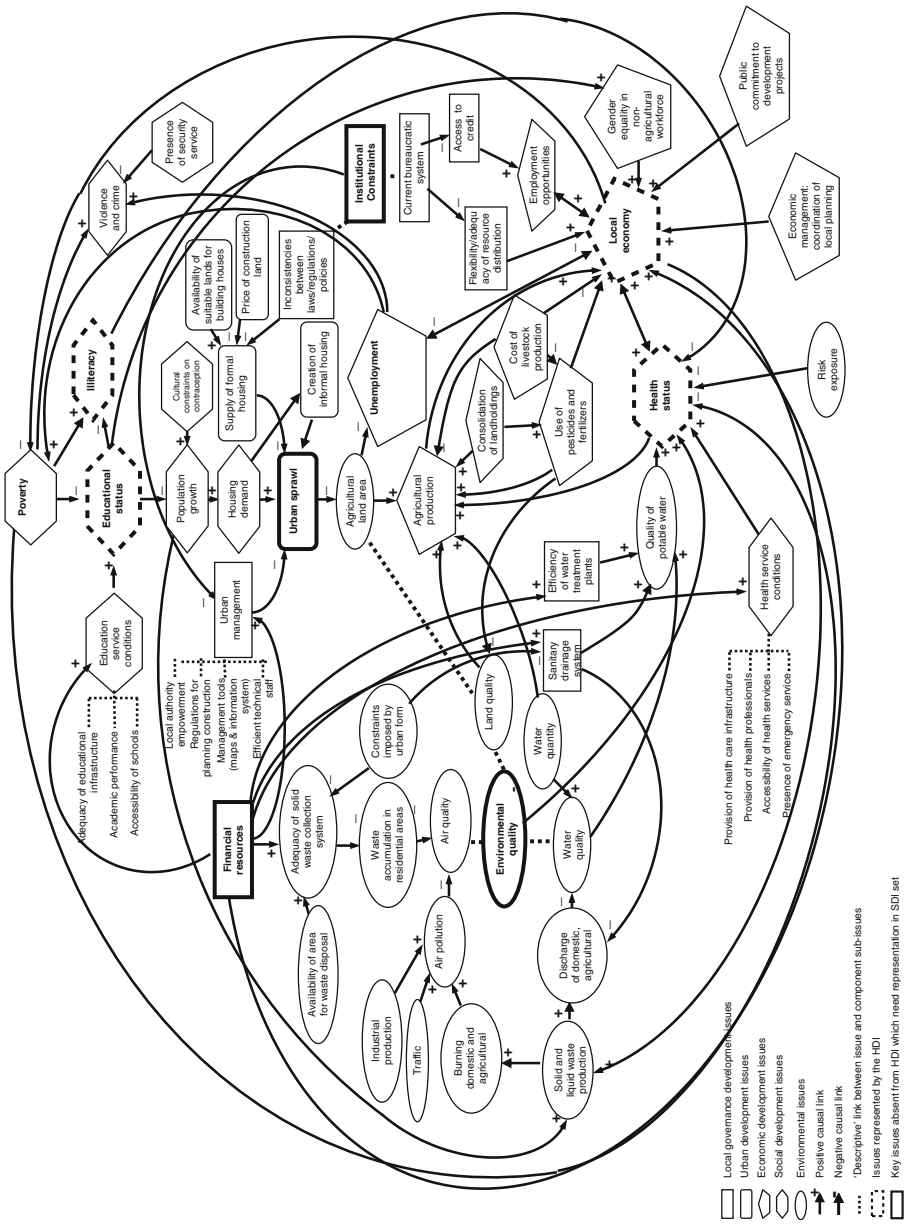


Fig. 1 The village system model

amongst these villages with respect to both physical area and population size, as shown in Table 4.

The values for each indicator were standardised, using as a benchmark the 'leader value', i.e. the highest value reached for each indicator within the eight villages (OECD 2003; Munda 2005). This step enables comparison to be made easily within the set—a factor which would grow in importance with a larger set of villages—and introduces the

Table 3 The core set of sustainable development indicators and their provisional replacements (HDI component indicators are italicized)

Theme	Core indicator set	Unit
Local governance development	Local authority empowerment	Yes/no
	Flexibility over resource distribution	Yes/no
	Size of local revenues	LE/capita
Urban development	Rate of urban encroachment on agricultural land (1985–2002)	%/year
Economic development	*Unemployment rate*	%
	GDP per capita	pppUS$
	Gender equality in non-agricultural labour force	% of women working
Social Development	Population growth rate (1996–2001)	%/year
	Life expectancy at birth	Years
	Provision of health service infrastructure	Hospital beds/10000 people
	Adult literacy rate	%
	Combined 1st, 2nd & 3rd level gross enrolment ratio	%
The environment	Loss of agricultural land (1985–2002)	Feddan/year
	Connection to sanitary drainage system	%
	Quality of potable water	Yes/No
	BOD in water bodies	mg/l
	Ambient concentration of air pollutants	% of days when standards/ guideline values are exceeded
	Data for the preceding 3 indicators were unavailable at the time of the project fieldwork. For illustrative purposes they have been replaced by two proxy indicators:	
	Population connected to water supply network	%
	Presence of sources of air pollution (Sources of air pollution within village's context can be divided into four main categories; burning of domestic waste, burning of agricultural waste, pollution from industry and motor traffic. There are no available data to indicate the concentration of pollution resulting from each category, so this indicator is calculated on the simple basis of presence/absence: the presence of any sources within a category scores 1, absence scores zero.)	Scale from 1–4

concept of 'real-world ideal values' (Munda 2005) as achievable targets for sustainable development. Here its use is largely illustrative, as with more data these villages could usefully be benchmarked against achievable 'leader values' from elsewhere in Egypt. (Such standardisation does, however, create problems for comparisons between sets, or over time as the 'standard' changes. This is an inevitable cost of benchmarking in this way—as with every decision in defining indicators there are gains and losses in terms of the information they present).

Table 5 shows the values of each indicator for the eight villages, together with the data after normalisation: each value is expressed either as a percentage of the leader village score, where this is the highest value in the set, or as the inverse of this, where the desired value (i.e. the 'leader') is the lowest achieved value. (For example, high revenue is desirable, so the leader value is that of Menshaat El Keram and the other village scores are

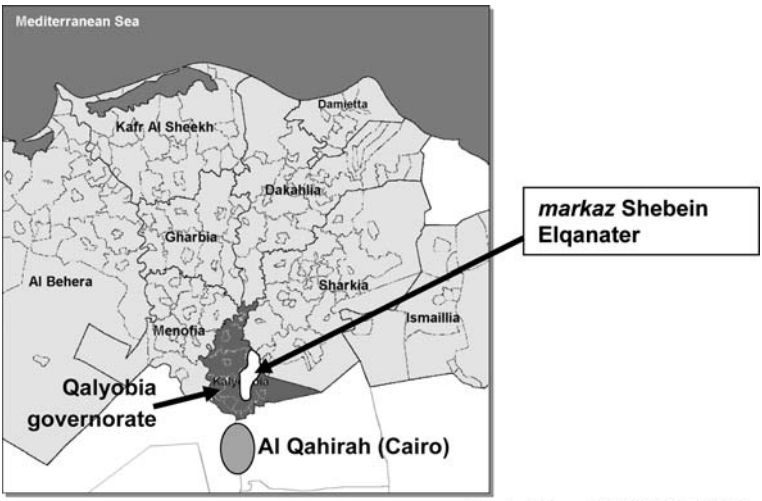


Fig. 2 Location of *markaz* Shebein Elqanater within the context of Lower Egypt

Table 4 The eight 'mother' villages of *markaz* Shebein Elqanater—basic data

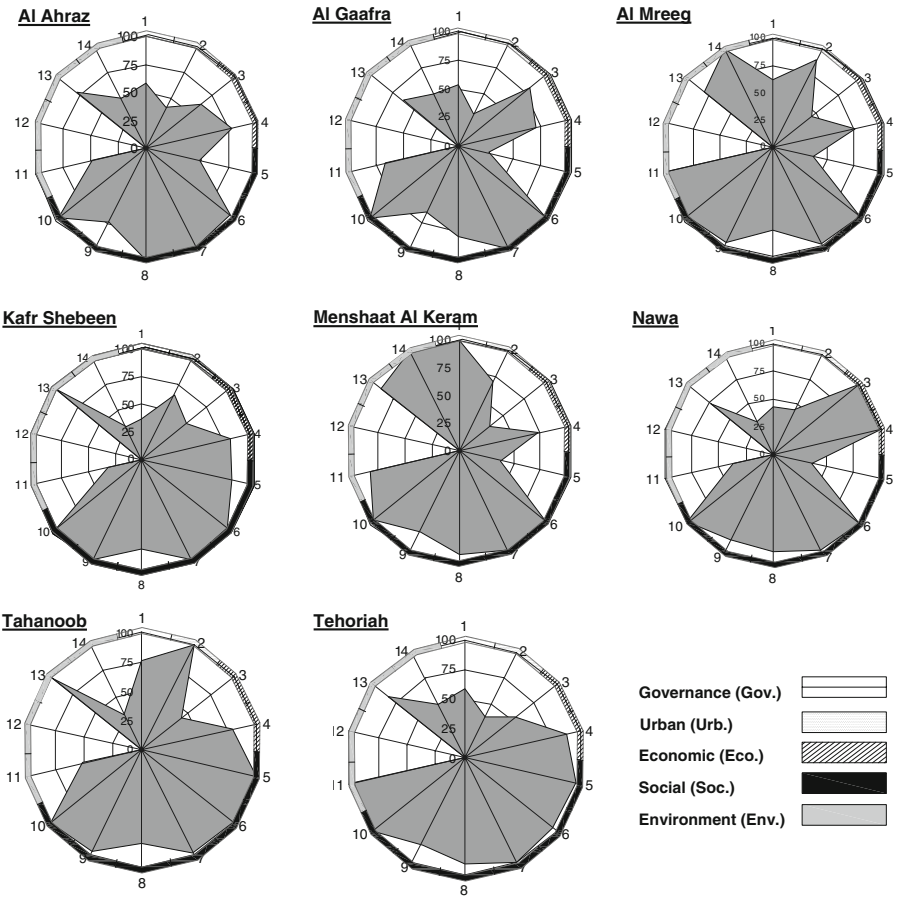
Village	Population 2001 (000 s)	Area inside the official demarcation of 1985 (feddan)	Total land area (2003) (feddan)
Kafr Shebein	27.6	143	255
Tahanoob	19.3	135	204
Nawa	23.3	86	186
Al Mreeg	10.5	60	95
Tehoriah	5.9	28	65
Menshaat Al Keram	12.8	60	104
Al Ahraz	13.9	59	132
Al Gaafra	8.5	33	88

expressed as percentages of this, i.e. 100 × village value/MEK value. Conversely, low urban encroachment is desirable, so Tahanoob is the 'leader' with 3% and the other village scores are calculated as 100 × 3/value.) These scores thus range from 0 to 100%, where 100% is the benchmark for sustainability within the set, and are shown graphically using 'radar diagrams' in Fig. 3 (cf. Munda 2005). (Note that the first two indicators—those from the local governance theme—are necessarily constant across these villages because they all lie within the same *markaz*, and hence have been dropped from the illustration. The twelfth—connection to the sanitary drainage system—has been retained, since its constant, zero value is a contingent aspect of these particular villages. Changes to this over time, and variation in connection rates between villages, are entirely possible).

The diagrams show very distinctly the development problems in each village and highlight the differences between them. Thus, for example, while a common problem in all villages is the lack of adequate sanitary drainage systems there are also idiosyncratic problems. For example El-Gaafra has a particularly high urban growth rate and low representation of women in the labour force, while Menshaat El-Keram shares the latter

Table 5 Illustrative set of indicators for the eight villages, showing the original indicator values and normalised scores ('distance from the leader' method; in bold italics)

Village	Al Ahraz		Al Gaafra		Al Mreeg		Kafr Shebeen		Menshaat Al Keram		Nawa		Tahanoob		Tehoriah	
Indicator																
Size of local revenues (LE/capita)	4576	***58***	4266	***54***	4828	***61***	2884	***37***	7867	***100***	3416	***43***	5958	***76***	4628	***59***
Rate of urban encroachment on agricultural land (%/year)	7.3	***41***	9.8	***31***	3.4	***88***	4.6	***65***	4.3	***70***	6.8	***44***	3.0	***100***	7.8	***38***
Unemployment rate (%)	7.8	***62***	5.9	***81***	11.0	***44***	9.2	***52***	13.9	***35***	4.8	***100***	11.1	***43***	8.8	***55***
GDP per capita (pppUS$)	2571	***78***	2287	***70***	2444	***75***	2644	***81***	2397	***73***	3276	***100***	2595	***79***	2873	***88***
Gender equality in labour force (% of women working)	9.6	***48***	5.5	***27***	7.4	***37***	16.6	***82***	7.6	***38***	7.3	***36***	20.2	***100***	19.2	***95***
Population growth rate (%/year)	1.15	***96***	1.11	***99***	1.10	***100***	1.13	***98***	1.11	***100***	1.11	***100***	1.12	***99***	1.16	***95***
Life expectancy (years at birth)	67.2	***99***	67.8	***100***	67.1	***99***	67.8	***100***	67.2	***99***	67.0	***98***	67.3	***99***	68.1	***100***
Provision of health service infrastructure (beds/10,000 people)	26.1	***100***	20.9	***80***	19.9	***76***	20.9	***80***	24.4	***93***	23.3	***89***	21.0	***80***	23.5	***90***
Adult literacy (%)	54.3	***73***	47.8	***64***	71.7	***96***	74.8	***100***	59.7	***80***	65.2	***87***	72.4	***97***	61.3	***82***
Level of educational achievement (gross enrolment ratio) (%)	70.9	***99***	71.5	***100***	71.5	***100***	71.0	***99***	71.0	***99***	71.0	***99***	71.2	***100***	71.3	***100***
Loss of agricultural land (feddan/year)	4.3	***49***	3.2	***66***	2.1	***100***	6.6	***32***	2.6	***81***	5.9	***36***	4.1	***51***	2.2	***95***
Connection to sanitary drainage system (%)	0	***0***	0	***0***	0	***0***	0	***0***	0	***0***	0	***0***	0	***0***	0	***0***
Connection to water supply network (%)	71.5	***79***	56.5	***63***	71.9	***80***	90.0	***100***	80.0	***89***	64.8	***72***	88.2	***98***	74.7	***83***
Air pollution sources (score 1–4)	2	***50***	2	***50***	1	***100***	3	***33***	1	***100***	3	***33***	3	***33***		***50***



Key

Theme	Indicator	Theme	Indicator
Gov.	1: Size of local revenues	Soc.	8: Provision of health service infrastructure
Urb.	2: Rate of urban encroachment on agricultural land	Soc.	9: Adult literacy
Eco.	3: Unemployment rate	Soc.	10: Level of educational achievement
Eco.	4: GDP per capita	Env.	11: Loss of agricultural land
Soc.	5: Gender equality in labour force	Env.	12: Connection to sanitary drainage system
Soc.	6: Population growth rate	Env.	13: Connection to water supply network
Soc.	7: Life expectancy	Env.	14: Air pollution sources

Fig. 3 Radar diagrams: provisional indicators for each sample village

problem but also has a significantly worse overall unemployment rate than the other villages.

Notwithstanding the problems associated with single indices as opposed to small indicator sets (in particular imprecision in terms of identifying problems and the risks associated with compensability), they have their role as simple comparison and communication tools.[13] While the separate indicators and associated diagrams show patterns of problems

[13] See Munda (2005) for a detailed example and critique of this approach, which he concludes by preferring the benchmarking and presentation of separate indicators. We have reversed the order of his argument here

within villages and allow comparison across these, the overall rankings through a single index can be used—cautiously—as a way of identifying priority areas for interventions. From the provisional indicator set we have therefore constructed a single 'sustainability index' for the eight villages. Following Munda (2005) we use the 'distance from the best and worst overall performers' for simplicity of calculation for our illustrative purposes. This approach to normalisation ranks each village according to its position within the range defined by the best and worst performing villages for each indicator.[14] As with benchmarking, this provides a good indication of relative performance, and highlights areas in which investment needs to be prioritised. As noted above, this is 'traded-off' against the loss of information on absolute changes, and progress towards any absolute standard.

These standardised scores are then summed to give a single index value for each village, weighted to reflect the relative importance attributed to the different indicators. In this case we gave each equal weight. Clearly, this in itself embodies a judgement, but there are no obvious reasons—certainly for our current purposes—to prioritise one or other indicator over another. The normalised scores and the resultant village sustainability indices are presented in Table 6, while Table 7 ranks the villages by sustainability index and compares these with their corresponding HDI values and ranks.

Table 7 demonstrates clearly the differences in rank according to the two indices—unsurprisingly confirming the basic assumption of this paper that integrating the environmental and institutional dimensions with the economic and social dimensions yields different results. To take one example, according to the HDI values Kafr Shebein is ranked first amongst the eight villages, which means that its performance with regard to social and economic development is at least relatively satisfactory. However, against the criteria established for the SDI it falls to fifth position. The single index cannot tell us any more than this, but returning to the indicators themselves, Fig. 3 shows that Kafr Shebein has considerable problems with regard to some of the environmental indicators, primarily the presence of sources of air pollution and annual loss of agricultural land.

5 Conclusions

The preceding sections demonstrate the possibility and the utility of developing a system of indicators which are tailored to the specific conditions of the villages of rural Egypt. The paper thus contributes to the national sustainable development indicator development process started recently (Ebrahim 2005) through a practical demonstration of one way forward, both in terms of a possible set of indicators and, perhaps more importantly, through its testing of a conceptual and methodological approach. Such development is particularly timely in the context of the processes of decentralisation, increasing attention to the broader concerns of 'sustainable development' and pressures for stakeholder involvement in planning and policy making which are evident in Egypt. In these final paragraphs, we draw a few more general conclusions, which we would argue are relevant

Footnote 13 continued
in order to arrive finally at a comparison of sustainability and human development indices, but concur with his critique.

[14] For each indicator, each village thus gets a score of 100 × (actual value-minimum value)/(maximum value-minimum value) or the difference between this figure and 100, depending on whether high or low scores are desirable. As with the benchmarking process above, the result is a set of scores ranging from 0 to 100%, with high scores desirable on sustainability grounds.

Table 6 Creating the sustainability index: indicator scores normalised using the 'distance from best and worst performers' method

Village	Al Ahraz	Al Gaafra	Al Mreeg	Kafr Shebein	Menshaat Al Keram	Nawa	Tahanoob	Tehoriah
Indicator								
Size of local revenues	34	28	39	0	100	11	62	35
Rate of urban encroachment on agricultural land	37	0	94	76	81	44	100	29
Unemployment rate	67	88	32	52	0	100	31	56
GDP per capita	29	0	16	36	11	100	31	59
Gender equality in labour force	28	0	13	76	14	12	100	93
Population growth rate	9	82	100	60	95	93	78	0
Life expectancy	18	73	9	73	18	0	27	100
Provision of health service infrastructure	100	16	0	16	73	55	18	58
Adult literacy	24	0	89	100	44	64	91	50
Level of educational achievement	0	100	100	17	17	17	50	67
Loss of agricultural land	51	76	100	0	89	16	56	98
Connection to sanitary drainage system	0	0	0	0	0	0	0	0
Connection to water supply network	45	0	46	100	70	25	95	54
Air pollution sources	50	50	100	0	100	0	0	50
Sustainability index (SI) (=sum of normalised indicator scores)	**492**	**513**	**738**	**606**	**712**	**537**	**739**	**749**

Table 7 SI and HDI values for the eight villages

Village	SI value	*Rank according to the SI*	HDI value	*Rank by HDI*	Rank by HDI in all governorate villages
Tehoriah	749	*1*	0.642	*5*	71
Tahanoob	739	*2*	0.656	*2*	30
Al Mreeg	738	*3*	0.651	*4*	42
Menshaat Al Keram	712	*4*	0.623	*6*	112
Kafr Shebein	606	*5*	0.665	*1*	17
Nawa	537	*6*	0.652	*3*	40
Al Gaafra	513	*7*	0.598	*8*	162
Al Ahraz	492	*8*	0.615	*7*	131

beyond the Egyptian rural setting of the fieldwork given that similar trends—and the current lack of sustainable development indicators—are common elements across other nations of the global South.

Firstly—and unsurprisingly—the single sustainable development index produces a different ranking of localities than the HDI. This is in itself significant—clearly if sustainable development is a policy objective then the HDI on its own is not an adequate index

for identifying priorities or monitoring progress, and should be augmented by an index which captures environmental and institutional aspects of the village system. Secondly, we contend that the methodology usefully produces nested sets of indicators which have different purposes. Collectively they can overcome some of the problems of trading-off complexity, comprehensibility and compensability which otherwise inevitably arise in choosing an indicator set or single index. Thus, the 'comprehensive set' gives the most detailed information, at a level of use to policy makers with specific responsibility for planning at the village scale. The 'core set' is far more manageable and easily comprehensible, particularly when presented graphically through, for example, radar diagrams—this level of detail can be used to compare different localities and identify priority needs. Simultaneously, however, careful selection hopefully maintains the holistic character of the comprehensive set and the underlying system model on which it is based. The single index is clearly the easiest to use, though the least informative—we would concur with Munda (2005) that it can best be used in conjunction with the core set.

Finally, the approach demonstrated the value of lay input from a range of stakeholders in identifying priority issues in the villages. The combining of lay and expert knowledge, and providing opportunities for mutual learning, is increasingly seen as an appropriate way forward for indicator development in widely differing settings. In the Egyptian context the project described here was about as participatory as possible given the relative novelty of any form of participatory planning—to the public, administrators and planners alike. With further experience of practicing participation, non-professional stakeholders' role should and probably could be enlarged in line with experience in other countries. However, in Egypt as elsewhere the ideal is not a purely 'bottom-up' approach but a balance of stakeholders inputs: the general public and the state both have legitimate interests in the nature of indicators used to guide planning processes. The challenge is to find ways to bring these often very disparate groups and interests together in effective and mutually beneficial ways.

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