

## Developing a Substantive Sustainability Framework for Urban Planning in Desert Regions in Egypt



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### ABSTRACT

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The Egyptian government is proposing numerous new development projects in the vast underpopulated desert regions as an integral part of its national urban development policy. These projects strive to achieve a stringent commitment towards sustainable development that is ambitious, dynamic and innovative. Thus, a well-defined sustainability framework, that integrates with the planning process of developments in desert regions, which consists of both procedural and substantive dimensions is necessary. However, there is very limited research on the substantive dimensions that are specifically suitable for desert regions. This paper aims to present a novel and tailored framework for identifying these substantive dimensions based on the results of a three-round Delphi survey, which seeks to identify and rate possible sustainability themes, targets, and actions for planning in desert regions. The survey was conducted through a structured Delphi process involving leading international and national experts in the fields of desert planning and sustainable development. The research resulted in thirteen sustainability themes, forty-six targets and one hundred and sixteen actions distributed over five dimensions. These findings identify critical concerns that could support planners, practitioners and policymakers throughout the planning process, although the processes of implementation, evaluation and monitoring are not explicitly covered by this paper.

## 1. INTRODUCTION

Sustainable development (SD) is an attempt to bridge the gap between achieving human's demands and the environment's ability to regenerate its natural resources [1]. It seeks to strongly link environmental, social and economic issues in decision making in a harmonised and balanced way [2]. There is a strong connection between SD and planning [3] as many frameworks have been developed, either, to consider SD in the planning process [4-7], or to evaluate and examine how effectively SD has been integrated into various planning practices after implementation [8-12]. Unfortunately, current planning theories are still not fully capable of considering SD [13], thus suitable frameworks are required to enable plans and policies to integrate and optimize SD principles into the planning process [2, 14, 15].

In line with this, many scholars have approved the suitability of 'substantive-procedural' paradigm when acknowledging SD in planning [1, 16-19], or as it is named 'ends-means' paradigm [20, 21], which helps to fully comprehend [22] and achieve [17] sustainability throughout the planning process. The substantive dimension (ends) reflects the goals of sustainability, or the 'What is to be sustained?' question, while, the procedural dimension (means) represents the processes and tools or the 'How it can be sustained?' [1, 14, 22].

Even though there is some consensus around the 'substantive-procedural' paradigm when planning for SD as

perceived as a holistic "*coherent combination*" [23], nevertheless, the substantive dimensions reflect the specific planning contexts [24] and there is no one model for all situations [25], but "*it should be applicable to an individual activity in a particular region*", where "*places differ*" [26], and there is "*location uniqueness*" [27] and it is "*location-specific depends on local environmental, economic and social constraints*" [4]. Furthermore, the importance of identifying the sustainability ends (substantive dimension) is critical to act as a guideline for development to be used to assess the means (procedural dimension) [28]. This argument emphasises the importance of developing a context-based tailored sustainability substantive framework, in this case, for desert regions. This should be seen as a necessary starting point which could then subsequently be applied to the planning processes, including evaluation and monitoring processes, which are beyond the scope of this current paper.

## 2. BACKGROUND: SUBSTANTIVE SUSTAINABILITY FRAMEWORK

Primarily, a sustainability substantive framework is an efficient structure for translating sustainability principles to measurable objectives or indicators for sustainability in different fields as tourism [29], transport planning [30], including urban [31, 32] and regional planning [33, 34]. There are several approaches to designing the substantive dimension

of SD. This research has adopted an ‘issues-based’ framework that defines the key issues of SD in a particular context, and evaluates the level of their consideration in the development of plans [35]. This approach was chosen because in a desert’s planning context, issues are the most critical, problematic and distinct aspect [36]. Accordingly, the first step in developing this framework was to identify the critical, context-specific sustainability issues in order to comprehend what needs to be properly considered in plans and policies [37].

Much of the literature discussing sustainability issues focuses on urban populated planning contexts [23], where the most commonly issues are energy conservation, land, air pollution, water quality, and solid waste management, etc. More recently, alternative planning contexts have been subject to more detailed investigation [38, 39] which proves that the sustainability issues fundamentally differ based on the specific planning context [27]. Desert contexts, however, have not been subjected to such investigation.

Whilst, there might be some sustainability issues that development in desert areas share with the populated urban areas, there are, nevertheless, huge differences between them. Specifically, research into desert areas ‘*must focus on new disciplines, ... research must now probe the impact of the development of settlements and the arid environment on each other*’ [36].

The ‘issues-based’ framework adopted in this research for designing a sustainability substantive framework is formed from three structured strands. The first strand mainly explores the issues for desert areas, as sustainability issues are context-specific [38, 40]. The second strand involves the setting of the targets, which enables the framework to move from general issues to specific and measurable targets [41], and provides detailed policy guidance that could be used as implementation mechanisms to facilitate the operationalization of SD principles into a practical concept [42, 43]. The third strand explores the actions [41] that are needed to direct, control, and regulate the development explicitly considering SD and helping to achieve the targets.

### 3. RESEARCH METHOD: DELPHI TECHNIQUE

#### 3.1 Why Delphi technique?

This paper employed a Delphi technique as the research method for data collection, in order to develop a consensus regarding what substantive sustainability strands (issues, targets and actions) should be considered when planning new urban development projects in desert regions. A Delphi approach typically aims at reaching the most reliable consensual view based on expert opinion for a particular issue [44]. Through an iterative process and based on feeding back the results of earlier phases, the relevant and subsequent responses of the participants to the consecutive phases aimed at reaching a consensual quantitative agreement towards an overall solution, decision, or prediction [45].

This technique was chosen for two reasons. First, it has proved to be useful in areas where there is uncertainty, a lack of empirical evidence, and is dealing with complex issues [46, 47] such as sustainability [48]. Especially when, exploring complex issues necessitates the need to develop a consensus [49, 50], and knowledge from experts who are familiar with this specific issue [47], as they help to achieve this goal. Secondly, it allows for the efficient gathering of information

from experts in different geographical locations, which adds more richness and robustness to the findings, due to their diversity in contexts and experiences [47].

#### 3.2 The panel members (size and selection)

The selection of panel members who have current knowledge and experience on the topic under discussion is considered a key element to the success, reliability and quality of any Delphi process [49, 51]. For this study, a panel of international experts in planning in desert environments and sustainability, and local experts in planning for Egypt’s deserts regions (practitioners and academics) were targeted, so that the Delphi gathered ‘*a diversity of experience, knowledge, skills, and cultural perspectives*’ [52].

The panel members were selected based upon: 1) Current or previous publications that are focused on planning desert areas and/or achieving SD in desert areas (within last five years) – a criterion for both the international and local experts. 2) Current or previous experience in planning projects in desert areas (within last five years) – a criterion for local experts. Table 1 shows the expertise of the panel members who actually participated in the process.

Defining the panel size is critical. Some of the literature suggests ten to eighteen experts on a Delphi panel should be the norm and this figure is manageable [47]. Others suggest slightly more, taking into account participants whose participation may lapse during the process [53]. Some suggest eighteen participants as typical and sufficient [54] or nineteen to twenty members, which is manageable and produces sound results [55]. The targeted panel size for this study was eighteen to twenty participants who would still be actively involved at the end of the process.

**Table 1.** Panel members participating in and completing the Delphi process

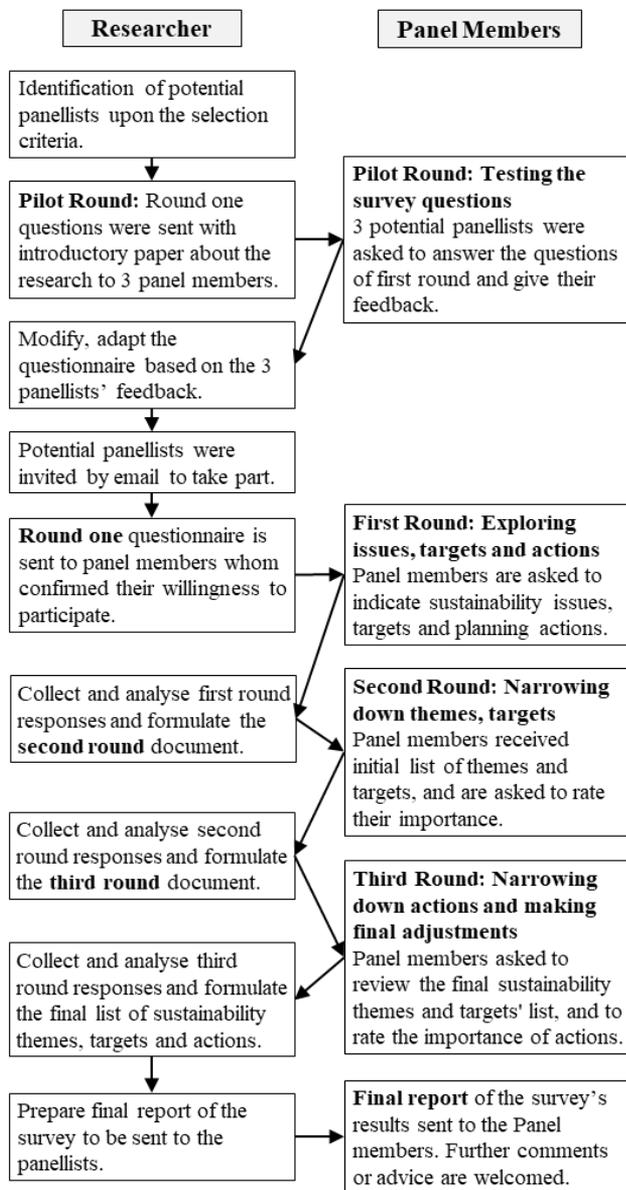
Distribution of the twenty experts based on		
Location	International	8
	National (Egypt)	12
Domain of knowledge	Sustainability/environment	3
	Planning in desert areas	11
Current experience	Both	6
	Academic (Publications)	8
	Practitioner (Projects)	8
	Both	4

#### 3.3 Delphi process design

In addition to an initial pilot round, a three stage Delphi process was designed. The first round was a qualitative generative round and was followed by two rating rounds. Figure 1 presents a detailed design of the Delphi process used here, where the experts’ responses that were received during the timespan of this Delphi process, are later reported and analysed in the results section.

##### 3.3.1 Pilot round: Testing the survey questions

Whilst pilot testing is considered optional in Delphi technique, it was still a considerable ‘*help to identify ambiguities and improve the feasibility of administration*’ [56]. A pilot round was undertaken in this research as it aimed to double check that the questions were understandable and were being interpreted in a consistent manner.



**Figure 1.** The designed Delphi survey process

An invitation to participate in the Delphi survey, including the pilot round and details of the three subsequent rounds, was sent, by email, to three potential panel members for comment, review and minor adjustment. Subsequently, upon acceptance of the invitation, the three experts received the first-round questionnaire and were asked: to give, as a minimum, five answers to each question, to provide their comments on the terms (issues, targets, actions) that were used for the questions, and to express any comments or observations on the Delphi structured questions in general (if there were any). Subsequently, the questionnaire was adjusted in light of this feedback.

### 3.3.2 First round: Brainstorming and exploring issues, targets and actions

With the objective of establishing a panel of eighteen to twenty participants and estimating a response rate of 40%, invitations were sent by email to a potential pool of fifty experts. Two reminders were sent to the invited experts who had not responded. In total twenty-seven experts initially agreed to participate. Yet, after sending out the first-round questionnaire, a total of twenty responses were received. In

subsequent rounds, there were further dropouts, so that in the end, eighteen experts responded to the second and third rounds.

The first-round questionnaire was sent to the experts, and it was accompanied with a supplementary document, which explained the aim of the research, its rationale, a description of the Delphi process and a commitment to respect the anonymity of participants and their ability to withdraw from the process at any time.

Usually, in conventional Delphi studies, the first round is largely unstructured, allowing the participants to *'identify and elaborate on those issues they see as important'* [57]. The first round sought to elicit open responses. These initial responses were then consolidated and combined into one list by the researcher.

The first-round questionnaire was framed around three main open-ended questions. The first question asked about the top ten key sustainability issues (topics) needing to be addressed for the planning of new developments in underpopulated desert regions. The second question enquired about the most important sustainability targets responding to each of the suggested sustainability issues. The third question asked about what the effective planning action(s)/mechanisms(s) could be to promote/implement each target.

### 3.3.3 Second round: Narrowing down themes and targets

In the second round, the panel members received a consolidated list of sustainability themes (a grouping of sustainability issues) and targets based on the outcome of round one. They were initially asked to review the summary of responses given in the first round by all experts collectively. Then, they were asked to rate the importance of each sustainability theme and targets for ensuring sustainability concerns were integrated into planning practice for new developments in underpopulated desert regions. The used rating scale was the Likert scale, containing five response options, ranging from, not at all important (scoring 1) to very important (scoring 5).

### 3.3.4 Third round: Narrowing down actions and making final adjustments

By the time of the third round, a consensus was emerging between the experts on a narrowed-down list of sustainability themes and targets. In this round, panel members received a synthesised list of sustainability themes and targets that emerged through consensus, then they were then asked to review and identify any areas they disagreed with. At the same time, they were asked to rate the relative importance of each planning/development action, again by using Likert scale, in order to explicitly consider sustainability concerns in planning practice, especially in the context of the planning for new developments in underpopulated desert regions.

As a final step, after the third-round analysis, a report summarizing the whole survey results was prepared and sent to each of the panel members, as promised in the initial invitation letter.

### 3.3.5 Measuring the level of consensus

As the focus of this study is to understand which issues, targets and actions should be prioritised when integrating SD principles into the planning and development in desert regions, it was necessary to understand the relative importance of each item, developed through the process of expert consensus building. In rounds two and three, the level of importance (5: 'very important', 4: 'important', 3: moderately important, 2:

slightly important’, or 1: ‘not at all important’) was measured according to the following benchmarks [58]:

- Strong positive consensus: at least 80% of respondents ranked the item four or five.
- Moderate positive consensus: at least 60% to 79% of respondents ranked the item or issue at least four or five.
- Elimination criteria: at least 80% of respondents ranked the issue one or two and thus could be discounted.

## 4. RESULTS

### 4.1 Pilot round results

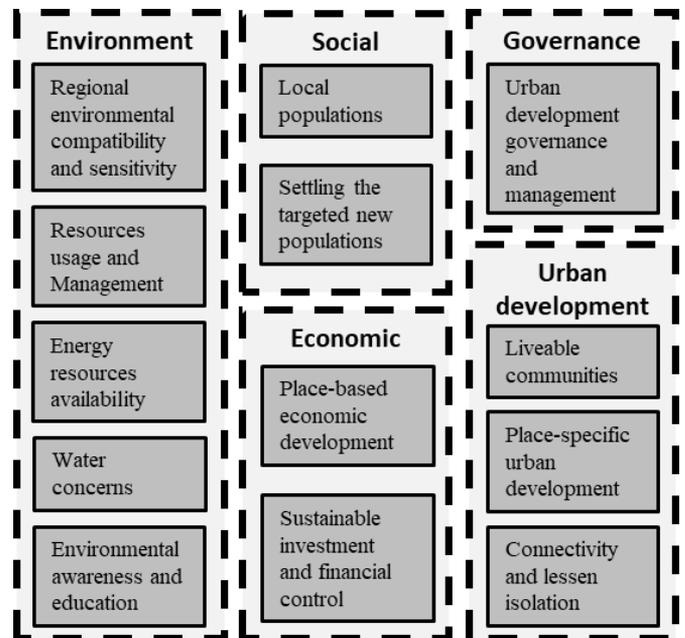
The feedback from the pilot round helped to amend the form for the first-round questionnaire making it clearer, shorter and more focused. Suggestions were made concerning three aspects. First, the used terminology, where it was advised that: 1) the term “policy areas” should be used alongside the term “issues”; 2) the term “policy directions” should be used alongside the term “targets”; and, 3) “planning or development actions” should be used instead of “planning mechanisms”. Second, changes in the questionnaire design, resulted in: 1) questions designed in a table format so that they were easy to read. 2) translating the questionnaire into Arabic, especially for national experts. and 3) adding a question about the related planning level for each item. Third, the addition of more information in the supporting document including: 1) an identification of the targeted type of deserts, and 2) clarification that in this research the framework was focused on being utilized only for the plan preparation though later it could have implications for the monitoring and evaluating of sustainability in the implemented plans. Based on this feedback the survey was redesigned before sending it out to the potential experts.

### 4.2 First round results

Generally, a thematic analysis is recommended in qualitative Delphi studies [44] to rephrase and combine responses [45], especially in the first round. During this initial stage, NVIVO software was used as the thematic analysis technique in analysing the qualitative responses of the experts.

In total, forty-three separate issues related to sustainable development for desert areas were suggested by the panel members. Issues that conveyed similar meanings were combined and rephrased into thirteen major sustainability themes. Each of these themes could be further categorised into five broader dimensions, forming a ‘domain-issues-based’ framework or termed “theme-orientated” framework [59], as shown in Figure 2, environmental, social, economic, governance and urban development.

Initially a total of three hundred and fifty-three targets were suggested. These were consolidated and combined to form seventy-two targets which were sent to the panel members for rating in the second round. Furthermore, these targets were found out to be relevant to three groups distinct phases of planning: 1) Pre-planning targets reflect the initial baseline before proposing interventions or developments in these regions; 2) Planning targets are mainly an outcome the planning process and decision making; and, 3) Post-planning targets are for preparing the implementation, monitoring and follow-up stages.



**Figure 2.** Initial classification of critical sustainability themes for desert regions

Finally, the total number of actions suggested were six hundred and twenty-seven. These were consolidated and reframed to form a synthesis of one hundred and forty-six actions. These were sent to the panel members for rating in subsequent rounds. Furthermore, these actions could also be related to specific stages of the planning process, notably decision making, monitoring and follow-up, with actions relevant to different levels of decision making, national, regional or local.

### 4.3 Second round results

In round two, the sustainability themes and targets were rated. Most of the sustainability themes received strong positive support, except for three themes, but even these enjoyed a degree of moderate positive consensus. They were: 1) Place-specific urban development (Regionally and locally), 2) Sustainable investment and financial control, and 3) Environmental awareness and education. Consequently, all the thirteen themes originally identified were included in the list of sustainability themes to be considered in the final round.

Regarding whether there was a degree of consensus with regards to the sustainability targets, seventy-two initial targets were rated. Thirty-one (43.1%) of targets gained strong positive consensus and a further fifteen (20.8%) targets gained moderate consensus, and hence, forty-six remained in the final target list to be considered in round three. Meanwhile, twenty-six of the targets (36.1%) were not considered important and were thus eliminated from further consideration.

### 4.4 Third round results

Round three aimed at reaching a consensus especially around the sustainability actions. Of the remaining one hundred and forty-six actions, sixty (41.1%) actions gained strong positive consensus, and fifty-six (38.4%) actions gained moderate support among the experts. On the other hand, thirty (20.5%) actions were not supported as being important and thus could be eliminated. Thus, the one hundred and sixteen

actions that gained both strong positive and moderate consensus were included in the final list of suggested actions.

The final, classified and detailed list of the three strands - themes, targets and actions – forming the sustainability substantive framework that was determined through a consensus building process by the panel members can be accessed through this link: <https://doi.org/10.7910/DVN/B9X9XR>. Figure 3 presents the number of themes, targets and actions in each of the five major dimensions to show the value given by the panel members to each dimension.

#### 4.4.1 Environmental dimension

For the environmental dimension, five sustainability themes, nineteen targets and fifty-four actions were identified. The panel members agreed that the most significant themes were: “Regional environmental compatibility computability and sensitivity”, “resource usage and management”, “energy resource availability”, “water concerns”, while the “environmental awareness and education” was considered of moderate significance and worthy of consideration.

As for the sustainability targets the panel prioritized fourteen of them, while a further five were considered of moderate significance. The fourteen significant targets were concerned with “reducing environmental stress”, “promoting appropriate economic activities”, “conservation of biological diversity”, “ensure prevention from natural risks”, “ensure the local validity and availability of resources”, “efficient resource usage”, “mitigating negative environmental impacts”, “developing independent local agricultural systems”, “use of renewable energy resources”, “energy efficiency”, “energy dependency for the region”, “clear identification of water sources”, “water use efficiency”, “governance control over these water resources” and last, “usage of diverse water resources”. The sustainability actions, with a strong positive consensus, amounted to thirty-five (64.8%) of fifty-four potential actions, while, actions gained moderate positive consensus were nineteen (35.2%) of the fifty-four actions. Of these, twenty-one actions (38.9%) are urban planning related, while, thirty-three actions (61.1%) are involved management,

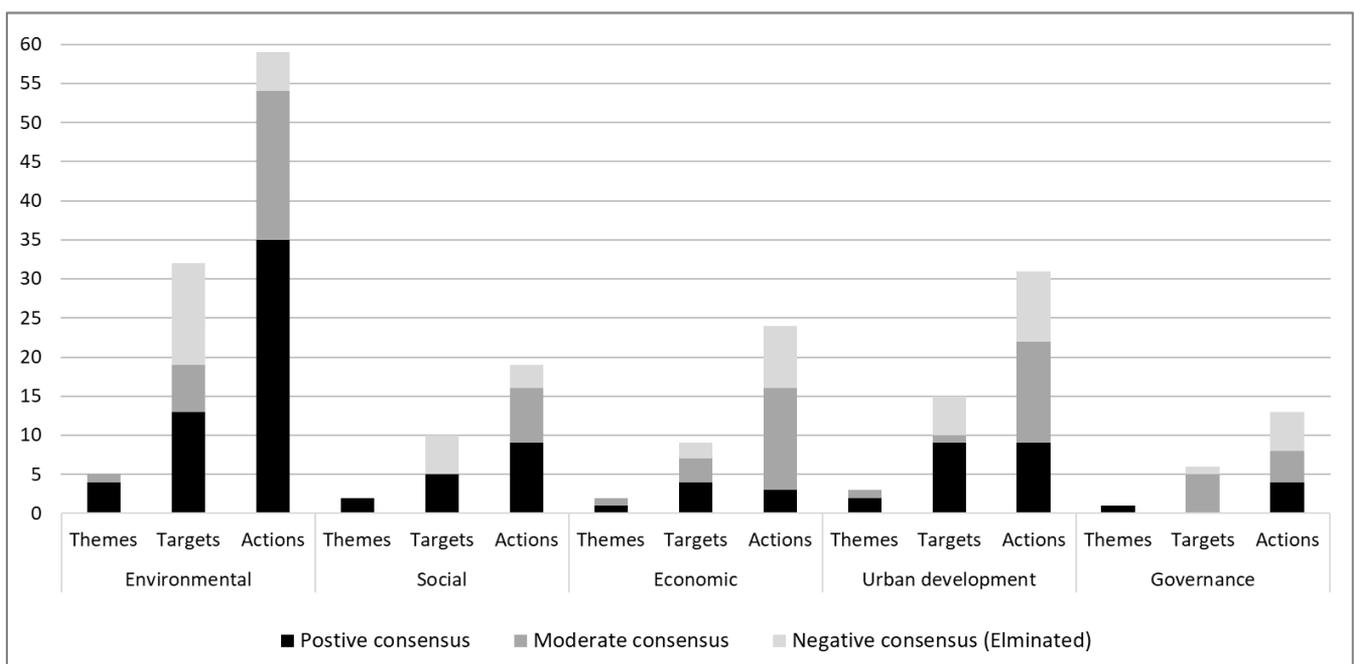
monitoring and follow-up issues.

#### 4.4.2 Social dimension

With the social dimension of sustainable development, two themes, five targets and sixteen actions were identified. The experts agreed that both themes and the five targets were a top priority. The themes were the importance of the involvement of “local populations” and “settling the targeted new populations”. The targets involved “understanding and reflecting needs and priorities of local communities”, “improving local communities’ development”, “supporting the participation of local communities”, “balancing the national target to alleviate population pressures and the capacities of desert environments” and lastly, “carefully considering the population size of new settlements”. The sustainability actions with strong positive consensus consisted of nine (56.3%) of the possible sixteen actions, while, actions with moderate positive consensus were seven (43.7%) of the sixteen. Of these, seven actions (43.7%) are urban planning related, while, nine (56.3%) are management, monitoring and follow-up related.

#### 4.4.3 Economic dimension

The economic dimension of SD produced two themes, seven targets and sixteen planning and developmental actions. With the sustainability themes, the panel members agreed that ‘place based economic development’ was very important and ‘sustainable investment options and financial control’ was of moderate importance. The panel members reached an agreement on the five targets, and rated the “creating local generation of capital and financial resources”, and “promoting investments in local economic projects” as the most important economic targets. The sustainability actions with a strong positive consensus comprised three (18.8%) of the sixteen, while actions gained moderate consensus consisted of thirteen (81.2%) of the possible sixteen actions. Of the sixteen actions, five actions (31.2%) were urban planning related, while, eleven actions (68.8 %) were management, monitoring and follow-up related.



**Figure 3.** Consensus reached around themes, targets and actions in each sustainability dimension

#### 4.4.4 Governance dimension

In the governance dimension of sustainable development, a strong positive consensus reached around one theme, five targets and eight actions. The single theme that gained high positive consensus was ‘urban development governance and management’. Yet, the five targets only gained a moderate consensus among the experts. The three highest scoring targets were “achieving a balance between environmental holding capacities and urban growth”, “capacity building for so that the authorities’ staff are knowledgeable” and “supporting self-governing communities”. The sustainability actions were split equally between strong and moderate positive consensus four actions (50%) each. Of these, 3 actions (37.5%) were urban planning related, while, 5 actions (62.5%) were associated with management, monitoring and follow-up.

#### 4.4.5 Urban development dimension

The three rounds yielded three themes, ten targets and twenty-two actions for the urban development dimension of sustainable development. The themes “liveable communities” and ‘connectivity and lessening isolation’ gained the highest rating, and “place-specific urban development’ gained a moderate rating. Nine out of the ten targets were rated as highly significant which were “the resilience of job opportunities”, having “a sufficient infrastructural base”, “reasonable access to all basic services”, “affordable/appropriate housing”, “sustainable desert-specific urban environments”, “balancing regional urban landscapes with environmental natural landscapes”, “designing desert-specific urban form allied to urban planning norms and standards”, “strong linkages/connectivity at all levels” and finally, “creating stable, safe and independent communities”. The sustainability actions with a strong positive consensus were nine out of twenty (40.9%). The remained were moderately scored. Of these, nine actions (40.9%) were urban planning related, while, thirteen actions (59.1%) were management, monitoring and follow-up related.

## 5. DISCUSSION

### 5.1 Contradicting but decisive views

The research was exposed to, and indeed, enriched by different insights and views reflecting the panel members variations in their knowledge and expertise. It could be noted that although there was a great deal of consensus on agreement on the sustainability themes, yet there was less agreement on sustainability targets and actions. However, there was a broad consensus related to targets and actions that addressed four main concepts: 1) Developing an accurate and robust database for maintaining the status quo of environmental, social and economic facets in desert regions, 2) Issuing a strict requirement for guidelines for sustainable desert development practices and the need for effective, robust processes of strategic environmental appraisal and environmental impact assessment based on definitive research, 3) Providing strong mechanisms for empowering local populations with the knowledge, economic incentives and political support for local traditional and indigenous development, 4) Implementing best practices in sustainable urban planning and economic development which were bespoke to desert regions, and 5) Ensuring a powerfully structured urban development management and governance in these regions.

On the other hand, three concepts exhibited obvious variations between experts. They were: 1) The suitability of considering desert regions as demographic “pressure release zones” for more densely populated regions, 2) How to provide incentives for moving people and industries from cities and densely populated regions to desert regions, and, 3) What should be the most efficient urban development policies in desert regions?

### 5.2 The special case of deserts and sustainable development

The initial variation in the experts’ views that was later narrowed to produce a more consensual perspective has strengthened the resulting substantive sustainability framework, as they provided the framework which was both, unique and specialised, to reflect the specific contexts of desert regions, rather than any other context. The experts highlighted the significant need for a bespoke case for the sustainable urban planning for underpopulated desert regions, where the exclusivity of these areas could not be adequately dealt with by just using the more general substantive sustainability frameworks that are used in the practice of sustainability for urban planning, which included primarily different tailored aspects for the populated urbanized core regions.

### 5.3 Consensus reflecting importance

The consensus around the variety of themes, targets and actions forming the proposed framework reflects the value given to the major dimensions regarding sustainability in desert regions. The results showed that highest emphasis and importance ratings were provided for “environmental” and “social” dimensions, followed by the “governance” dimension, then “urban development” and “economic” dimensions. Even though, the five dimensions are each arguably important, this rating clearly reflects that the higher value is being given to the relatively pristine condition of the ecosystems of these regions, together with the special characteristics of its local people in these environments. Following this, the presence of effective and resilient governance structures. Later, comes the economic and urban development dimensions.

### 5.4 Effectiveness of the substantive sustainability framework

The actions’ effectiveness is established through the Delphi process itself and, more particularly, through the involvement of international and national experts who are specialized in this field, academically and professionally [60]. On the other hand, the difference between effectiveness and efficiency is profoundly recognized [61], and an assessment of the later is vital for achieving successful sustainable development. Consequently, the efficiency of implementing an effective substantive sustainability framework should be the basis for the implementation and monitoring phases. But this is beyond the scope of this particular paper.

## 6. CONCLUSIONS

The novel contribution of this paper lies in answering a question of how can sustainable development be incorporated, substantively, in urban planning practices specifically for desert regions. Moreover, due to the increasing environmental

movement, numerous studies have recently been directed towards exploring tools and frameworks to incorporate sustainable development principles in the planning process, but mostly they are concerned with urbanized, populated regions. In the light of that, this study offers a state-of-the-art, three-stranded substantive sustainability framework, structured by Delphi method, to incorporate sustainable development practices, specifically aimed at the planning and development of underpopulated desert regions.

This research utilised experts' opinions to reach a consensus around three strands of a substantive sustainability dimension for desert regions. Experts who participated in the Delphi survey agreed about the importance of thirteen sustainability themes across five key integrated dimensions, with forty-six targets and one hundred and sixteen actions. This framework should be a useful tool for guiding, improving and assessing planning processes that are used in the implementation of the development in desert regions by explicitly including sustainability in all stages of the planning process. This is particularly important at the moment because of the emphasis, in Egyptian national policy, on the promotion of desert oriented sustainable development.

Future research can follow three trajectories. The first one is empirically testing this framework by evaluating the applied level of sustainable development in proposed plans in desert regions. The second trajectory can be to investigate the methods and procedures necessary to apply and activate each of the thirteen sustainability themes, and more detailed targets and actions that were identified in this framework. The third is building on the developed framework, to create a set of sustainability monitoring and evaluation indicators to evaluate the post implementation phase of any desert development. What is clear, however, is that if plans to decentralise development into underpopulated desert regions are to be realised, the sustainability rhetoric of national policy needs to be accompanied by substantive sustainability framework, which becomes embedded in every part of the process. This paper is hopefully a useful contribution to that journey.

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