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Economic and Social Commission for Western Asia (ESCWA)

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Statistical business continuity in Arab countries affected by conflict and post-conflict situations

Summary

The present document addresses the challenges of conducting statistical work in conflict zones, proposing solutions and recommendations. It introduces an innovative approach, adapting operational risk management (ORM) principles to national statistical offices (NSOs) in crisis situations. It also presents survey results from six conflict-affected Arab countries, highlighting the impact of such conflicts on NSO resources. The present document provides contingency solutions and resilience-building measures, including using mobile data, big data, and alternative data sources. It recommends implementing an ORM framework, identifying crucial statistics, and initiating specific projects to mitigate crisis effects. In addition, it recommends that member States establish national teams to implement risk mitigation measures tailored to their specific contexts, with ongoing support from the Economic and Social Commission for Western Asia (ESCWA).

The Statistical Committee is invited to review the content of the present document and discuss its recommendations.

Contents

Introduction

1. Conflicts significantly hinder the collection, management, dissemination and utilization of statistical data, which are crucial for making informed policy decisions, responding effectively to emergencies, delivering humanitarian aid, and planning for relief and recovery in post-conflict situations. In several Arab countries, conflicts have disrupted national statistical systems, leading to limited data collection processes, dysfunctional statistical operations, and an inability to conduct comprehensive statistical activities such as population and housing censuses. Moreover, conflicts have caused damage to or loss of civil registration records, and have limited the registration of vital events owing to the absence of a functioning legal authority.

2. In times of extreme crises, it is crucial for countries to ensure the continuity of their statistical systems. The collection, processing and dissemination of statistics are essential for society's functioning and emergency management. However, during conflicts, natural disasters or severe economic crises, maintaining the operational continuity of these systems becomes challenging. It is therefore essential to implement an approach based on operational risk management (ORM)[1] and careful planning to mitigate risks, and ensure an organized and efficient response in extreme crises.

3. The present document addresses the challenges of statistical work in conflict situations. It also proposes solutions and recommendations for Arab countries experiencing conflict. Work on this challenge has been requested on several occasions by member States of the United Nations Economic and Social Commission for Western Asia (ESCWA), as reflected in recommendations made by its Statistical Committee at its thirteenth and fourteenth sessions, requesting focus on building the capacity of conflict-affected member States to benefit from non-traditional data sources; and applying alternative statistical collection methods in conflict-affected countries, so as to provide the minimum amount of data required for decision-making.

I. Methodological approach

4. The present document proposes an overall crisis management approach based on the following sequence of operational and conceptual steps:

(a) **Adapt the main concepts of ORM**: The adaptation has been developed based on the specific scenarios of national statistical offices (NSOs) facing conflict situations. The main concepts relevant to describing NSOs, specifically their processes, resources, and statistical domains, are defined. Risk scenarios and their impact on NSOs are also considered. The tables were developed during the preparation of the present document, based on various related literature reviews and similar situations of conflict, risk disasters and humanitarian settings;

(b) **Conduct a comprehensive macro analysis**: The aim is to assess the situation of NSOs under extreme crisis conditions. This step was carried out through a questionnaire addressed to Arab countries in conflict and post-conflict settings, namely Iraq, Lebanon, Libya, the State of Palestine, Somalia, the Sudan and Yemen;

(c) **Identify and implement specific contingency measures**: The aim is to detect contingencies that can reduce major impacts on statistical processes, based on the findings of the previous steps and a detailed analysis that links the risk scenarios to resources and processes. The contingency measures provide some immediate response to crises, but without pre-existing business continuity plans, irreparable damages such as loss of historical data and interruption of critical operations can occur.

[1] The following documents provide a comprehensive explanation of the ORM approach: Philippa X. Girling, *Operational Risk Management: A Complete Guide to a Successful Operational Risk Framework,* 2013; Terje Aven and Ortwin Renn, *Risk Management and Governance: Concepts, Guidelines and Applications*, 2010.

A. ORM methodology

5. The methodological approach proposed in the present document has been developed specifically for it, and consists of an adaptation of the principles of ORM to the case of NSOs facing crises. ORM in organizations refers to the systematic process of identifying, assessing and mitigating risks that could disrupt an organization's ability to achieve its objectives effectively. This involves managing risks associated with internal processes, human resources, technology, and external events to ensure the organization's operations remain resilient and secure. ORM aims to enhance organizational resilience, protect the integrity and confidentiality of information, maintain stakeholder trust, and ensure compliance with established standards and best practices.

6. Typical activities of the ORM approach include the following:

(a) Creating an organizational structure responsible for managing operational risk;

(b) Stock-taking of all the organization's operational projects;

(c) Selecting critical processes, namely those that must be maintained even in a crisis situation;

(d) Identifying potential threats and associated risks, and assessing the likelihood of their occurrence;

(e) Describing the consequences of risk materialization on technological, logistical, human, organizational and methodological resources;

(f) Designing risk mitigation measures to reduce risks to an acceptable residual level;

(g) Testing the measures through regular testing activities;

(h) Periodically updating the framework to accommodate any changes in the risk landscape.

7. The ORM approach described above applies to any organization, so it must be adapted in order to be effectively utilized in NSOs.[2] A further adaptation is also required for projects in countries facing high-impact crisis scenarios, such as conflicts. These countries need immediate solutions to ensure the production of crucial statistics. This particular constraint necessitates streamlining the methodology to its essentials,[3] thus enabling rapid and sustainable interventions within a short time frame.

B. Adaptation of the ORM methodology to a generic NSO: definitions

8. The phases of the main statistical process of an NSO[4] encompass data collection (surveys), data processing, data analysis, publication and dissemination, inter-institutional coordination, and monitoring and evaluation. Each phase plays a vital role in ensuring the smooth functioning of the statistical system.

9. The resources required to support these phases include technology, logistics, organization, human resources and methodology. Methodological resources are particularly emphasized due to their critical role in risk reduction and process efficiency.

[2] The following references illustrate how ORM principles can be applied to statistical fields: Robert Nisbet and other, *Handbook of Statistical Analysis and Data Mining Applications*, 2009 (while focused on data mining and statistical analysis, the handbook includes sections on managing risks in statistical data applications); Thomas P. Ryan, *Statistical Methods for Quality Improvement*, 1989 (this book covers statistical methods and includes chapters on managing and improving quality in statistical processes, relevant for operational risk management in statistical systems).

[3] The ORM methodology has been adapted to this specific use case, while maintaining its essential phases: identification of risk scenarios, analysis of the impact on resources of essential statistics, and application of contingency/mitigation measures.

[4] Nizhni Novgorod, High-level workshop on modernization of official statistics, 2014.

10. The key statistical domains are demographic statistics, price indices, agricultural statistics, business statistics, external trade, and national accounts. Each domain relies on the phases of the aforementioned statistical process and on resources to function effectively.

11. Six risk levels (0 to 5) are defined, ranging from ordinary situations with no particular risk to scenarios involving maximum impact, such as civil war or catastrophic natural disasters. These risk levels help categorize the severity and type of crises that may affect a statistical system (table 1). The highlighted boxes are those relevant in the case of an extreme crisis situation.

Table 1. Risk scenarios

Risk level	Specific risks
0 = Ordinary situation	No particular risk
1 = Low risk	Temporary network or power interruptions
2 = Medium risk	Minor logistical issues, limited access to areas
3 = High risk	Minor natural disasters, strikes
4 = Very high risk	Local conflicts, major natural disasters, only some areas of the country are available for NSO surveys
5 = Maximum impact scenario	Civil war, devastating natural disasters

Source: Compiled by ESCWA.

12. The impacts on resources and processes are classified into five levels, from no impact (0) to extreme impact (4). This classification assists in understanding the severity of different crises on statistical systems (table 2).

Table 2. Levels of impact

Impact level	Description
0	No impact on resources or processes
1	Minor impact, easily manageable
2	Moderate impact, requiring significant adjustments
3	High impact, causing major disruptions
4	Extreme impact, threatening the continuity of operations

Source: Compiled by ESCWA.

13. Table 3 sets out how resources affect the phases of the statistical process. Methodological resources in particular have the most significant impact.

Table 3. Impact of resources on phases of the statistical process

Statistical process phases	Resources				
	Technology	Logistic	Organization	Human resources	Methodology
Data collection (survey)	2	2	2	3	4
Data processing	3	1	2	2	4
Data analysis	3	1	2	2	4
Publication and dissemination	4	3	2	2	4
Inter-institutional coordination	3	2	3	3	1
Monitoring and evaluation	2	1	2	2	3

Source: Compiled by ESCWA.

C. Adaptations of the ORM methodology to NSOs facing crises: the way forward

14. First of all (step 1), it is necessary to create an organizational structure responsible for managing the ORM system. In the case of statistical shocks caused by extreme crises, this structure can be effectively replaced by a small group of individuals with a designated leader, who will coordinate all planned interventions and ensure communication with ESCWA.

15. This can be called a "lightweight" approach as the complete application of the ORM framework would require, among other things, the creation of an organizational structure dedicated to the management of the system, responsible for drafting a series of documents (such as a complete process map, and a threat and risk map); the establishment of a network of process managers and contacts at the organizational units that manage the processes; and the formation of dedicated teams to carry out periodic tests of countermeasures.

16. It is then (step 2) necessary to identify "crucial statistics", without necessarily conducting a complete and detailed inventory. A crucial statistic is defined as “a statistical output that must be ensured in any crisis situation, either in its entirety or at least through some of its key phases”. It is important not only to define crucial statistics, but also to determine an acceptable level of quality for their release. For example, if a price index is usually released monthly, it may only be released quarterly during a crisis.

17. Crucial statistics with their accepted levels of quality are essential for decision-making and must be maintained to ensure the continuity and resilience of an organization's core functions, regardless of the severity of the disruption.

18. An example of crucial statistics by statistical domain is given in table 4.

Table 4. Example of crucial statistics (by domains)

Statistical domain	Crucial statistics at yearly level
Demographic statistics	Deaths, births, immigration, emigration
Price indices	General price index
Agricultural statistics	Production and cultivated land for major cultivars
Business statistics	Total production in value of goods and services
Foreign trade	Total value of imports and exports
National accounts	Total value of gross domestic product

Source: Compiled by ESCWA.

19. Subsequently (step 3), for each domain in which crucial statistics fall, it is necessary to identify the phases of the statistical process in which it is essential to intervene with contingency measures to mitigate the effects of the crisis.

20. As suggested in table 5, this task can be developed by jointly considering the phases and the statistical domains of crucial statistics.

Table 5. Phases and domains of crucial statistics

Phases	Domains					
	Demographic statistics	Price indices	Agricultural statistics	Business statistics	Foreign trade	National accounts
Data collection						
Data processing						
Data analysis						
Publication and dissemination						
Inter-institutional coordination						
Monitoring and evaluation						

Source: Compiled by ESCWA.

21. In the example set out in table 6, the reported crucial statistics are price indices, national accounts and the inter-institutional coordination phase of every domain.

Table 6. Example of crucial statistics matrix

Phases	Demographic statistics	Price indices	Agricultural statistics	Business statistics	Foreign trade	National accounts
	Deaths, births, immigration, emigration	General price index	Production and cultivated land for major cultivars	Total production in value of goods and services	Total value of imports and exports	Total value of gross domestic product
Data collection (survey)		✔				✔
Data processing		✔				✔
Data analysis		✔				✔
Publication and dissemination		✔				✔
Inter-institutional coordination	✔	✔	✔	✔	✔	✔
Monitoring and evaluation		✔				✔

Source: Compiled by ESCWA.

22. For each crucial statistic (step 4), it is recommended, where feasible, to conduct a targeted survey using interviews, questionnaires and on-site observations, and to gather information from available sources.

23. The final task (step 5) involves identifying contingency measures. Once the crisis situation is over, these will serve as risk mitigation measures within the ORM framework. To define the contingency measures, it is necessary to start with the following:

(a) The crucial statistics that need to be ensured (with their critical phases);

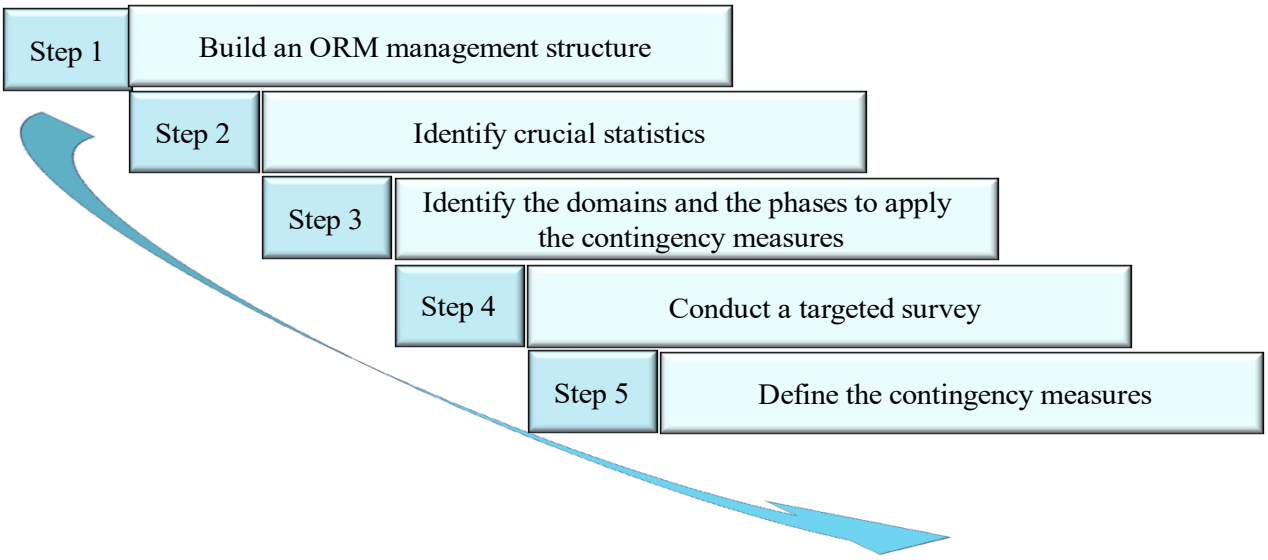
(b) The type of threat that has occurred;

(c) The effects the threat has had on the resources needed to execute the crucial statistics in question and, from this point, the appropriate countermeasure(s) that should be designed (or multiple countermeasures, if it is appropriate/necessary to differentiate between the various phases of the statistic. For example, a measure

that allows for the phase of data collection in a contingency, such as telephone surveys, may not be suitable for the phase of publication and dissemination).

24. Figure 1 depicts the sequence of the steps of the proposed methodological approach.

Figure 1. Steps of the methodological approach



Source: Compiled by ESCWA.

II. Macroanalysis of survey results

25. To provide actionable recommendations to NSOs of Arab countries affected by conflict, the ESCWA secretariat has conducted a survey (see questionnaire in the annex to the present document) with a view to assessing the status of countries' statistical systems under extreme crisis conditions. Conducting a survey through a questionnaire is part of the crisis management approach advocated for in the present document, structured into five steps (figure 1, step 4 relates to conducting a survey).

26. The survey was conducted in six conflict-affected Arab countries (Iraq, Lebanon, Libya, Palestine, the Sudan and Yemen), which in the risk scenario and impact assessment report are either at level 5 (civil war, devastating natural disasters) or at level 4 (local conflicts, major natural disasters, only some areas of the country are available for the NSO surveys) of table 1.

27. Based on the relationships between risk scenarios and the resources of statistical systems, the questionnaire focused on the (significant) effects of the crisis on individual resources, and evaluated their impact on the various statistical processes that these resources support, also referring to the various statistical areas.

28. The questionnaire aims to highlight the ex-ante situation, the crisis that occurred, and the effects on statistical production, considering any contingency measures that may have been adopted.

29. For the purposes of the survey, the statistical resources (whose status is to be known before, during and after the crisis) are grouped into the following five categories: technology, logistics, organization, human resources, and methodology.

30. The following analyses the key findings of the questionnaire section by section.

A. General questions on statistical production capacity

31. Internal or external conflict situations cause general problems. The effects on security, the economy, and access to parts of the territory for conducting statistical surveys were recorded. All statistical areas were impacted. The level of impact on specific statistical regions is highly dependent on specific local conditions (logistical, technological, methodological).

32. There were significant challenges in various areas, including a critical lack of funding and insufficient budgets, for both NSOs of surveyed countries and their branches, coupled with delayed payments and low salaries for field workers, which threatens ongoing work. Security concerns and instability severely hinder operations, including data collection, especially in vital statistics like births and deaths, as well as broader population statistics. Outdated frameworks and expired census projections further complicate efforts. Moreover, the situation is exacerbated by non-compliance from facilities, a shortage of qualified staff, and inadequate equipment. In addition, weak coordination between government agencies and the private sector, outdated infrastructure, and a weak statistical culture pose additional challenges. Rapid economic, social and political changes make it difficult to keep pace with current needs, while insecurity and continuous migration further impede comprehensive data collection.

B. Specific questions for vulnerable countries

33. For all countries, it was impossible to meet international reporting requirements; generate critical monthly and quarterly statistics; produce administrative data statistics; and fulfil the scheduled timeline for publications, data releases, and planned surveys. The use of alternative/non-traditional data is currently limited to two categories that are not particularly innovative (telephone surveys and administrative data), and are sensitive to the effects of the crises. In contrast, more innovative sources (such as web sources, social media/citizen-generated data/web sources, and remote sensing/satellite imagery) that offer greater resilience to crises are not being utilized.

34. Many NSOs have either completely stopped or partially reduced data collection through personal interviews. As a result, the scheduled timelines for publishing and releasing data have been significantly changed, leading to delays or a complete halt in many projects.

C. Specific questions for countries divided into two or more parts

35. In cases where a country is divided into several parts, statistics continued to be produced, taking the entire territory as a reference. However, there is a problem with the reliability of data for statistics from specific parts of the country.

36. In conflict-affected countries, the continuation of official statistical production varies. Some countries maintain regular statistical activities for at least part of the country, while others do not. Where regular production persists, it may cover either the entire country or only specific regions. The extent of coverage varies by region, population, and agricultural and industrial production, with some areas partially or fully included. Key issues affecting statistical output in conflict zones include outdated data, and challenges in measuring expenditure, living standards, poverty and health, especially in areas previously controlled by militias. Ongoing institutional communications exist in some cases to support statistical production, even in regions not currently covered. Coordination efforts involve various institutions, with contributions from governmental agencies, NGOs, universities, research centres, and the private sector.

D. Internal capacity to generate and process data from innovative techniques

37. There is no evidence of domestic capacity to produce data using new technologies, with the exception of two countries that responded that they had conducted experiments on artificial intelligence and mobile

applications. One of these two countries claimed to be able to produce statistics using mobile applications and social media.

38. Surveyed NSOs generally lacked internal capacity to generate and process data using advanced techniques, such as artificial intelligence, machine learning, predictive analytics, digital transformations, crisis maps, and dashboards. There were mixed responses regarding the use of mobile applications and social media, with some capabilities reported. Experimentation with these techniques was limited, with most responses indicating that NSOs had not conducted statistical production experiments, except for one positive experience involving artificial intelligence, machine learning and predictive analytics in relation to a project on using big data in official statistics, namely population statistics, undertaken in collaboration with ESCWA. The project was highly successful, earning a World Summit on the Information Society prize for its excellence in data entry, speed and accuracy, and is considered repeatable using internal resources.

E. Questions for each statistical area

39. In general, responses to the first question on an illustration of the main issues were varied, and provided a reasonable basis for conducting country-specific insights for a possible second phase of the work to propose specific targeted actions at the country level. The following is a summary of the main issues reported by a single country during the crisis:

(a) **Agricultural statistics:** data collection affected by economic crises, the COVID-19 pandemic, and security conditions due to internal conflicts;

(b) **Business statistics:** issues related to data accessibility, internal conflict, and difficulties in keeping trade registers up to date;

(c) **Foreign trade:** statistics affected by economic volatility, currency devaluation, and changes in trade volume caused by economic and political crises;

(d) **National accounts:** production complicated by a lack of reliable and timely data owing to economic problems and difficulties in accessing areas of the country.

40. Table 7 sets out aspects that can be strengthened to improve statistical production, and alternative sources that can produce information.

Table 7. Aspects that can be strengthened

Statistical area	Aspects that can be strengthened	Alternative sources
Demographic statistics	Developing methodologies for statistical work to ensure continuity during conflict and war, a national statistical system law, electronic linkages and strengthening coordination mechanisms between data producers and users, using modern technical applications at all stages of the statistical process, and using satellite images and geographic information system applications for population estimates.	Data from international organizations
Price indices	Developing methodologies for statistical work to ensure continuity during conflict and war, and making price estimates when data collection is not possible. • Cloud storage enables data recovery. • Technical support in the field of data updating. • Training on all issues that improve performance. Using an automatic price data collection tool to scrape web data from some consumer outlets.	Data from international organizations
Agricultural statistics	Developing methodologies for statistical work to ensure continuity during conflict and war	Satellite images and geographic

Statistical area	Aspects that can be strengthened	Alternative sources
	• Developing modern methods for agricultural statistics. • Using modern methods and tools in agricultural surveys, such as satellite images and geographic information systems. • Strengthening cooperation with research centres, agricultural bodies, and universities. • Training and capacity-building for staff members of Central Statistical Offices. • Strengthening coordination between national statistical system actors.	information systems Data from international organizations
Business statistics	As for this domain and the following two, the questionnaires received did not include specific suggestions, but only a general reference to the use of alternative data sources.	Data from international organizations
Foreign trade		Data from international organizations
National accounts		Data from international organizations

F. Summary of results

41. Analysis of the responses reveals a general awareness of possible ways to make the statistical system more resilient in crisis situations. The most evident aspect that emerges, however, is that none of the surveyed countries seem to have put in place a solid ORM system. The existence of an ORM system is a necessary condition to ensure an effective response to an extreme risk situation. In the absence of a well-defined ORM framework, the interventions implemented in crises are the result of improvisation: they are derived from reactions built on the basis of contingent needs.

42. The analysis of the survey responses provides a complete picture of the effects of extreme crises (resulting from internal or external conflicts) on NSOs, and on the ability to produce reliable statistics for national and international uses. The effects concern all the resources used by NSOs, including technological, logistical, human and organizational resources.

43. The following are among the critical issues highlighted:

(a) Unfortunate logistics which, due to the concentration of NSO physical offices in limited areas,[5] exposes them to destruction with a consequent loss of all technical resources contained therein;

(b) Partial (qualitative-quantitative) insufficiency of human resources (a situation reported by some countries even before the crisis);

(c) A lack of innovative technologies and a consequent lack of skills among statistical personnel, even in terms of conducting experiments;

[5] This means that in all the cases reported by respondents and examined in the study, there is no territorial distribution of the sites (and data) of the central statistical offices that would ensure continuity in the event of a risk scenario. A valid distribution could involve establishing physical locations in different geographical regions, located far apart from each other, and connected in a way that ensures real-time alignment of stored information, so as to minimize the effects of a crisis affecting the territory (earthquakes, civil war, floods, epidemics).

(d) Extreme vulnerability of data collection mechanisms (often reliant on human activities carried out in the area), which is also a consequence of a lack of advanced technologies (such as satellite detection and alternative information sources);

(e) A lack of recovery mechanisms (with a few exceptions) based on agreements and collaboration with other public and private entities capable of carrying out processes, but blocked by the consequences of the crisis, or providing alternative data to meet national and international statistical production needs. The availability of alternative data to be used in the event of a crisis is in most cases tied to the presence of specific agreements and protocols with the suppliers (public and private) of such data.

III. Suggested solutions

A. Methodological actions

44. Put in place a lightweight ORM framework. According to international ISO standards, the existence of an ORM framework is a necessary condition to ensure an effective response to every risk situation.

> **ISO 31000:09:** The information provided in risk treatment plans should include also those who are accountable for approving the plan, and those responsible for implementing the plan. Both monitoring and review should be a planned part of the risk management process, and involve regular checking or surveillance. Responsibilities for monitoring and review should be clearly defined.
>
> *Source*: International Standard, Risk management: guidelines, 2018.

45. It is also necessary to identify crucial statistics that should continue to be produced under each statistical domain (see table 6).[6]

B. Contingency measures

46. The following list includes solutions which can be suggested to countries affected by crisis situations to be implemented as contingency solutions in the event of a crisis but also in perspective as solutions aimed at increasing the resilience of national statistical systems in the future. Some examples of application of contingency solutions by countries not included in those surveyed is contained in the following chapter of the present document.

1. *Innovative solutions that could be adopted as contingency measures*

47. In extreme crisis conditions, it is essential to adopt innovative technology-based solutions to enhance the resilience of national statistical systems. One promising strategy is the use of satellite data and remote imagery. The analysis of satellite imagery can provide valuable information on various aspects, such as population density, land use changes, and the location of housing structures and infrastructure. This information can then be used to estimate population or economic conditions, offering hope for accurate estimations in conflict areas.

48. Mobile positioning data is another useful method. By collecting data from mobile devices, information on population movements, density and other demographic variables can be gathered in near real-time. However, this method requires access to data from mobile phone operators, and may raise privacy and security concerns.

[6] The following source demonstrates an effective approach to implementing contingency plans in a coordinated and functional manner: Dario Russo, *A guide for managers and professionals to exploit the transformation of finance in the next ten years: effectively govern the transition to new financial ecosystem*, 2024.

49. In situations where face-to-face surveys are not possible, remote surveys conducted via telephone or online interviews can be used. Although this approach may limit the sample to those with access to technology, it can still provide valuable data.

50. Innovative data collection methods, such as using drones, are also effective. Drones can gather images and data in otherwise inaccessible areas, monitoring large regions and obtaining real-time information on living conditions and infrastructure.

51. The Multiple Indicator Cluster Surveys (MICS) model, used by the United Nations Children's Fund (UNICEF) and other organizations in challenging operational environments, is highly adaptable for estimates in conflict contexts. By combining data from various sources and methodologies, MICS significantly improves the accuracy of estimates.

52. Another approach is to establish a network of local information providers who can collect data through direct observations or interviews. This requires proper training and security measures to ensure the safety of these providers.

53. Lastly, conducting experiments on various methodologies is crucial for regularly integrating new approaches into the statistical process, thereby enhancing the overall resilience and accuracy of data collection efforts.

2. *Solutions adopted as mitigation measures and as contingency measures following adaptation*

(a) *Infrastructure*

54. To strengthen the resilience and flexibility of statistical infrastructure, several key strategies and best practices can be adopted. Firstly, the use of virtualization technologies is recommended to enhance flexibility and improve overall system resilience. It is crucial to ensure regular updates and maintenance of infrastructure, minimizing vulnerabilities and optimizing performance.

55. Adopting open-source software with broad community support can provide reliable and sustainable solutions, while also allowing for greater adaptability. Regular backups of data and software configurations are essential and should be complemented by the implementation of off-site and cloud-based backup strategies to safeguard against data loss.

56. It is important to conduct regular testing of disaster recovery plans to ensure preparedness and effectiveness. Automating backup processes can also help ensure consistency and frequency, reducing the risk of human error. Moreover, having spare devices readily available can minimize downtime in the event of hardware failure.

57. For device management, mobile management solutions should be implemented to monitor and manage devices remotely, ensuring they remain secure and operational. Communications is another critical aspect: the implementation of multiple communication systems, including email, telephony and radio, is recommended, alongside the creation of emergency communication protocols to ensure swift and coordinated responses during crises.

58. In terms of data storage, public cloud computing should be utilized to store critical data securely, while temporary satellite networks can provide reliable connectivity when traditional networks are compromised. The use of open-source software and online tools that are accessible from any Internet-connected device offers additional flexibility, particularly in remote or resource-constrained environments.

59. To further enhance resilience, portable software on USB drives can be used for quick deployment across various systems, and paper data collection forms can serve as a reliable backup method when digital solutions are not feasible. Data collection can also be conducted via telephone or radio, ensuring that it continues even in challenging conditions. For critical communications, the use of satellite phones or radios is advised, guaranteeing that key personnel remain in contact. Lastly, instant messaging platforms and social media can be leveraged for real-time coordination and information sharing during emergencies.

(b) *Human resources*

60. To enhance the resilience of human resources in statistical systems during severe crises, the following strategies are suggested: engage with international experts to bring in specialized knowledge and support; establish partnerships with educational institutions to ensure ongoing training and skills development; and foster collaboration with other statistical organizations and build a network of relationships, which not only enhances knowledge exchange and introduces new perspectives, but also serves as a contingency solution in times of need.

61. The continuous training of staff members is essential for managing crises and fostering innovative solutions. Fostering a culture of innovation within an organization is important to encourage staff members to develop new solutions and improve existing processes. It is essential to regularly train personnel on the latest updates, software tools, and device maintenance to maintain their proficiency. In addition, staff members should be equipped with the necessary skills for effective crisis communication during emergencies. Continuous education programmes are vital to keeping the workforce aligned with latest industry practices. Information technology (IT) support staff should receive ongoing training to handle and resolve technical issues during crises. When urgent needs arise, rapid onsite training should be ensured to equip staff members with the required skills. It is possible to use remote consultancy services via the Internet or phone to access expert advice and support.

62. It is necessary to proactively hire skilled personnel and experts to strengthen the team's capabilities, especially during critical times, and to add technical staff members during crisis settings to handle increased workloads and ensure system stability. In addition, using external technical support through temporary contracts is vital to help internal resources during peak periods, and make use of locally available IT resources to maintain statistical business continuity operations. Implementing remote support systems to maintain operations, even when staff cannot be physically present, is also important.

63. It is necessary to make counselling services available to support the mental health and well-being of staff members during stressful times. It is vital to implement psychological support through helplines to assist staff in managing stress and emotional strain. Encouraging the creation of internal support groups among staff members is important, so as to foster a sense of community and mutual aid during difficult times.

64. It is essential to provide management training programmes to enhance decision-making and crisis management skills, and to clearly define roles and responsibilities to ensure effective responsibility and division of labour, particularly during a crisis. Establishing an emergency team with a delegation is vital to ensure rapid reaction during crises. It is also important to conduct regular performance evaluations and provide feedback, and to introduce stress management programmes to help staff members cope with the pressures of working in crises settings.

(c) *Logistics*

65. To mitigate the effects of an extreme crisis on a national statistical system, various logistics-related strategies can be employed. One key approach is establishing leasing contracts with local and international transport providers to ensure the availability of transport resources. Moreover, the planning of alternative routes and modes of transport is crucial for maintaining operations during disruptions.

66. Collaboration with local authorities is essential to ensure access to necessary areas. Remote sensing technologies, such as drones and satellite imagery, can be utilized to monitor and assess conditions in a timely manner. If data collection points are compromised, planning alternative data collection points becomes necessary.

67. To ensure a reliable power supply during crises, the installation of backup generators and solar power systems is recommended, along with securing contracts with energy suppliers that prioritize emergency supply. The use of low-energy devices can further reduce the strain on power resources.

68. For physical infrastructure, rental contracts for alternative spaces in various locations can provide flexible solutions, and building designs resistant to natural disasters can protect critical facilities. Security systems should be implemented to safeguard these facilities from potential threats.

69. To maintain operational continuity, stockpiling consumables in adequate quantities and signing contracts with multiple suppliers are vital to avoid supply chain interruptions. Regular supply planning and stock tracking ensure that resources are managed efficiently.

70. Locally available alternative transport means should be utilized when necessary, and partnerships with humanitarian organizations can provide additional emergency transport options. Remote technologies, like drones, can be leveraged for surveys, and data collection through local intermediaries or field collaborators can continue in the absence of regular teams.

71. Temporary solutions, such as using tents or containers as alternative structures, can provide several options during a crisis. Collaboration with local entities for alternative spaces and purchases from local markets can strengthen logistical resilience. Moreover, the sharing of resources among partner organizations enhances the collective ability to respond effectively to crises.

(d) *Organizational resources*

72. To enhance the resilience of a national statistical system during an extreme crisis, various organizational strategies can be employed. A key measure is the periodic review and updating of procedures to ensure they remain relevant and effective under changing circumstances. Regular simulations and exercises are essential for testing these protocols and identifying any potential weaknesses. It is also important to maintain detailed and accessible documentation of all procedures, so that they can be easily referenced during a crisis.

73. Continuous training for managers in crisis management is essential to equip them with the main skills needed to deal with challenging situations. This training should be supported by delegation of clear responsibilities and roles to ensure effective emergency responses. The creation of emergency committees with the power to make rapid decisions can significantly speed up response times.

74. Another critical strategy is the development of detailed business continuity plans that outline how operations will continue during a crisis. These plans should include the allocation of specific resources for crisis management. The plans should also be constantly monitored and updated to reflect new developments.

75. Training staff members on strategic and contingency planning is also crucial, as is the use of project management software to improve planning and coordination. Plans should be regularly updated based on evolving situations, and simplified emergency procedures should be implemented to facilitate quick action.

76. In times of crisis, rapid communication of protocols adapted to the specific circumstances is essential. A temporary crisis committee with decision-making powers can be formed, and authority may be delegated to local leaders if top management is unavailable. Onsite basic emergency plans should be implemented, and coordination with international partners can provide additional support. Lastly, simplified and flexible

emergency plans should be used, allowing for rapid adaptation based on conditions in the field, ensuring that the response remains effective even as the situation evolves.

IV. Selected experiences and best practices

77. The present section provides examples on how innovative solutions can be adapted as contingency solutions in crisis situations. Various countries utilize big data, specifically mobile phone data and call detail records (CDR), to gather data on displacement and population movements during disasters.

78. These disasters include natural events such as floods, hurricanes and earthquakes, as well as biological hazards like epidemics. Traditional data sources like censuses and surveys have limitations in quickly capturing large-scale population movements. In contrast, CDR data offers real-time, detailed information on population movements, which is essential for effective disaster response and policymaking.

79. CDR data can be highly effective for disease surveillance, because it can track population movements and interactions in real time. The following are some key ways CDR data is utilized:

(a) Tracking population movements: CDR data helps monitor how people move between regions, which is crucial for understanding how diseases spread geographically. For instance, during an outbreak, CDR data can identify areas with high mobility that may be at greater risk of disease transmission;

(b) Predicting disease spread: By analysing travel patterns and the frequency of contact between individuals, health authorities can predict the potential spread of infectious diseases. This helps in planning and implementing targeted interventions;

(c) Identifying high-risk areas: CDR data can highlight regions with high population density and frequent movement, which are more susceptible to outbreaks. This information is vital for deploying resources and health-care services efficiently;

(d) Real-time monitoring: Unlike traditional data collection methods, CDR data provides real-time insights, allowing for timely responses to emerging health threats. This is particularly useful during fast-spreading epidemics;

(e) Evaluating intervention effectiveness: Post-intervention, CDR data can be used to assess the impact of measures such as lockdowns or travel restrictions, by comparing mobility patterns before and after the intervention.

80. Overall, CDR data offers a dynamic and timely approach to disease surveillance, strengthening capacity to effectively respond to public health emergencies.

A. Experience 1

81. In 2010, following the devastating earthquake in Haiti,[7] cholera spread rapidly owing to poor sanitation and crowded living conditions. Researchers utilized CDR data from mobile phones to track population movements and predict the spread of the disease. The following explains how the process was carried out:

(a) **Data collection:** CDR data provided information on the locations and movements of millions of people, including the time and location of calls and messages. This allowed researchers to map out where people had travelled;

(b) **Movement patterns:** By analysing CDR data, researchers identified patterns of movement between different regions, crucial for understanding the potential spread of the disease;

[7] Clarence Lio, Methodological guide on the use of mobile phone data: displacement and disaster statistics, 2024.

(c) **Predictive modelling:** Movement data was used to create models predicting the spread of cholera, which helped identify high-risk areas;

(d) **Targeted interventions:** Health authorities used this information to prioritize interventions, such as setting up treatment centres and distributing clean water and sanitation supplies in the most affected areas.

82. The use of CDR data showcased its potential for real-time disease surveillance and response, providing valuable insights beyond traditional data collection methods.

B. Experience 2

83. During the Ebola outbreak in West Africa between 2014 and 2016,[8] researchers and health organizations used CDR data for disease surveillance. They leveraged CDR data to track population movements and predict the spread of the virus. The following explains how the process was carried out:

(a) **Data collection:** Mobile phone operators provided anonymized CDR data, including information on the locations and movements of millions of subscribers. This data was crucial for understanding how people were moving within and between affected countries;

(b) **Movement analysis:** By analysing CDR data, researchers could identify patterns of movement and areas with high population density, helping them understand how the virus was likely to spread geographically.

(c) **Predictive modelling:** Movement data was used to create models that predicted the spread of Ebola. These models helped identify regions at higher risk of new infections, enabling health authorities to focus their efforts on them.

(d) **Targeted interventions:** With insights from CDR data, health organizations implemented targeted interventions, such as setting up checkpoints, distributing medical supplies, and deploying health-care workers to the most affected areas. This helped contain the spread of the virus more effectively;

(e) **Resource allocation:** Real-time data allowed for better resource allocation, ensuring that medical supplies and personnel were sent to areas where they were most needed. This was particularly important in managing the limited resources available during the outbreak.

84. The use of CDR data during the Ebola outbreak demonstrated its potential for enhancing disease surveillance and response, and providing timely and actionable insights that traditional data sources could not offer.

C. Experience 3

85. A third example is the real-time platform for providing analytical insights for government disaster response teams in Turkey.[9]

86. Turkey is particularly vulnerable to natural disasters owing to its location and geological structure. More than 95 per cent of the country lies in one of the most active earthquake and landslide regions worldwide. In the event of emergencies, information on the worst affected areas, where people are located, where they are heading, and how many people need rescuing is a crucial element of delivering time-sensitive information and resources to civilians. However, due to the nature of disasters and the devastating impact that they can have on infrastructure, this crucial information is often sparse.

87. Turk cell partnered with GSMA to develop an application called Galata, utilizing insights from mobile big data to deliver real-time analytics. It processes and ingests more than 100 billion events per day into a

[8] Ibid.

[9] Ibid.

smart analytics tool that can identify how many people are affected by disasters in all areas of Turkey. It enables disaster response teams to find citizens among the ruins of disasters to save lives and ensure that the most vulnerable citizens receive timely and targeted support and resources.

88. Galata was developed with a dedicated delivery, operations and regulatory team to ensure that it was up-to-date and fully compliant with relevant privacy regulations. It can produce aggregated population statistics by processing raw signal data in real time. In the event of a disaster, authorized members of the governmental emergency response and aid institutions can request information from a security-approved operations team. The team is responsible for round-the-clock monitoring and maintenance, and can provide analytical outputs in less than an hour, following a clearly defined process of internal security checks. Galata was developed through pilot testing over two years, before being implemented as a production service.

89. To ensure functionality in the event of a real disaster and measure the accuracy and speed of the application, its algorithms were tested quarterly using simulated field exercises. Only a select group of employees acted as test subjects. They used their head office as a proxy for a region before monitoring Galata's response to a known number of test subjects.

D. Experience 4

90. The earthquake that struck Haiti on 12 January 2010 caused a significant population movement out of the capital, Port-au-Prince.[10] This movement complicated relief efforts due to a lack of accurate population displacement estimates. Subsequently, in October 2010, a cholera outbreak occurred in several communes around the city of St. Marc, raising concerns about the potential spread of the disease to other parts of the country.

91. In response to these events, mobile network data was utilized to estimate population movements. Analysis of Digicel SIM card positioning revealed that approximately 630,000 people left Port-au-Prince within 19 days following the earthquake, and their destinations closely matched the results of a retrospective population-based survey conducted by the United Nations. Furthermore, within 12 hours of receiving the data from Digicel, SIM card location analysis was used to identify the destinations of individuals leaving the area where the cholera outbreak began, assisting in identifying potential areas for the spread of the disease.

92. This case demonstrates the potential of mobile phone data analysis in estimating population movements following a disaster, facilitating more effective geographic distribution of relief responses. It also highlights that once partnerships with mobile phone operators are established and SIM card data can be retrieved and processed, identifying priority areas for outbreak response and preparedness can be done within hours.

93. Key steps taken in producing these statistics included filtering SIM cards based on call activity before and after the earthquake and during the cholera outbreak period, and using the daily location of SIM cards to estimate population movements. The study also compared SIM card data with the results of a United Nations population-based survey, revealing consistency between the two sources.

94. However, limitations were also acknowledged, such as potential biases due to lower mobile phone use among specific groups in the population, low cell tower coverage in some areas, and the impact of the earthquake on mobile network capacity and power supply infrastructure.

V. Recommendations to surveyed countries

95. The following recommendations are made to surveyed countries for discussion:

[10] Ibid.

(a) **Recommendation 1:** Establish a lightweight ORM framework;

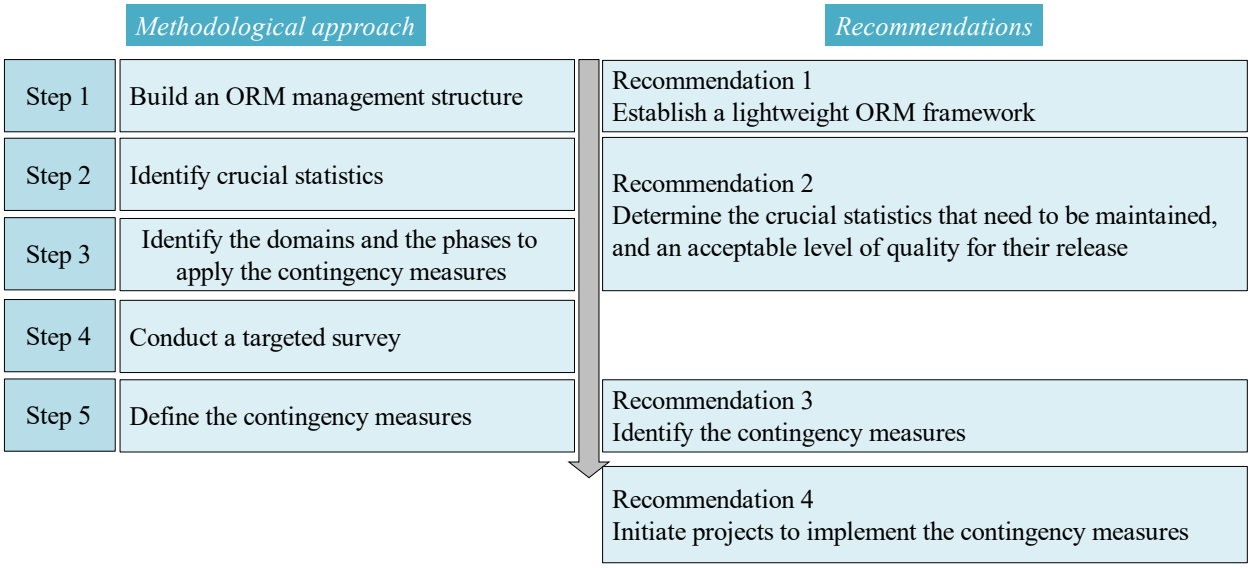
(b) **Recommendation 2:** In line with suggested methodological requirements, determine the crucial statistics that need to be maintained during a crisis, even if their quality is temporarily reduced; and define an acceptable level of quality for their release;

(c) **Recommendations 3:** Identify contingency measures to mitigate the effects of the crisis on crucial statistics production, referring to the list of measures contained in the present document;

(d) **Recommendation 4:** Initiate specific projects to implement contingency measures.

96. Figure 2 offers a visual representation of the sequence of actions envisaged by the methodology described previously and by the above recommendations.

Figure 2. Methodology versus recommendations



Source: Compiled by ESCWA.

VI. Way forward

97. Concerned countries could envisage forming national teams to implement the suggested risk mitigation measures, each according to its context and challenges. National teams would help countries to determine priorities, needed capacity-building, intervention details, coordination mechanisms, potential service providers and system integrators, costs, funding mechanisms, and result tracking.

98. The ESCWA secretariat will continue to support these countries in implementing the above-mentioned recommendations based on their demand.

99. The Statistical Committee is invited to review the content of the present document and discuss its recommendations.

Annex

Questionnaire sent out to national statistical offices in Arab countries affected by conflict

Code	Question
1.1	Please clarify the main issues that have affected the production of the country's official statistical output.
1.2	What are the statistical areas most affected by the aforementioned issues? Please refer to the letters that represent the statistical areas, and rank them based on the magnitude of impact. Start with the most affected area first, followed by the second most affected area, and so on. Do not include statistical areas that were not affected by the war situation. (A) Demographic statistics (mortality, births, migration, migration). (B) Price indices. (C) Agricultural statistics (production and cultivated areas for crops). (D) Business statistics. (E) National accounts. (F) Foreign trade.
2.1	Has the National Statistical Office (NSO) stopped data collection through personal interviews?
2.2	Has the conflict affected the ability of the NSO? Consider the following list.
2.2a	To meet international reporting requirements?
2.2b	To generate critical monthly and quarterly statistics?
2.2c	To produce administrative data statistics?
2.3	Has the NSO changed the scheduled timeline for publications?
2.4	Has the NSO changed the scheduled timeline for data releases?
2.5	Has the NSO suspended or postponed fieldwork for planned surveys?
2.6	Does your institution use alternative/non-traditional data sources/methods to produce statistics? Consider the following list.
2.6a	Telephone survey?
2.6b	Administrative data?
2.6c	Web sources?
2.6d	Social media/citizen-generated data/web sources?
2.6e	Remote sensing/satellite imagery?
3.1	If the conflict-affected country is divided, does the production of official statistics continue regularly for at least one part of it?
3.2	Even if the answer to question 3.1 is positive, does regular statistical production continue for the entire country or just part of it?
3.3	What is the approximate proportion of the part covered by the state from the total state in terms of: Consider the following list.
3.3a	Region.
3.3b	Population.
3.3c	Total agricultural production.
3.3d	Total industrial production.
3.4	If regular statistical production continues for part of the country, what are the key issues affecting statistical

Code	Question
	output in that area?
3.5	Are there any ongoing institutional communications to ensure the production of statistics, even for the part not currently covered by official statistics?
3.6	If the answer to question 3.5 is positive, please clarify the state of the arrangements.
4.1	Does the NSO have the internal capacity to generate and process data from all four techniques listed below to produce statistics? Consider the following list.
4.1a	Artificial intelligence (AI), machine learning (ML), and predictive analytics (PA).
4.1b	Mobile applications (MA) and social media (SM).
4.1c	Digital transformations (DT).
4.1d	Crisis maps (CM) and dashboards (DA).
4.2	Has the NSO conducted statistical production experiments for each of the four techniques listed, either in collaboration with external partners or as part of international cooperation? Consider the following list.
4.2a	Artificial intelligence (AI), machine learning (ML), and predictive analytics (PA).
4.2b	Mobile applications (MA) and social media (SM).
4.2c	Digital transformations (DT).
4.2d	Crisis maps (CM) and dashboards (DA).
4.3	If the answer to any of the questions 4.2 is "Yes", please consider the most relevant experience: Consider the following list.
4.3a	Specify the statistical area in which the experiment was conducted.
4.3b	If available, provide the publication link or make it available, or submit the technical report.
4.3c	State your evaluation of the conducted experiment.
4.3d	Indicate whether it is repeatable using internal resources.
5.1	Please describe the main issues characterizing statistical production in this specific statistical area.
5.2	Are there any institutional aspects that can be strengthened to improve the production of statistics?
5.3	Is there any alternative source (such as administrative data, surveys conducted by an international statistical organization, etc.) that can independently from the NSO, continue to provide information related to the statistical area?
5.4	If the answer to question 5.3 is yes, please describe the source briefly and explain the main problems that the NSO might face in accessing it.

Source: Compiled by ESCWA.
