

Resilience Performance Scorecard (RPS) Methodology

Summary

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1 CONCEPT

Resilience to natural hazards and disasters is often defined as “the capacity of individuals, communities, organisations, cities, and nations to respond, cope and recover from a disaster” (UNISDR, 2009). Following the axiom that “what gets measured gets managed,” the ability to measure resilience is increasingly being identified as a key step towards earthquake risk reduction. Measuring resilience is difficult, however, and existing quantitative metrics of resilience (often in the form of indicators or composite indicators) suffer from key limitations. For instance, the leading resilience metrics that are currently used in research and for practical applications are uncertain due to data limitations. Most indicator-based methods utilise a broad-brush approach using secondary source census data that may neglect the true underlying drivers (or lack thereof) of resilience within communities. Also, resilience indicators exhibit a large degree of uniformity in index construction approaches that ignore, because of ecological fallacy (Pacione, 2005), the context of the natural hazard or the communities at risk. Such uniformity may result in misleading conclusions if dimensions of resilience are ignored, or if weakly influential dimensions are overrepresented.

For earthquakes, there is a critical need for methodological advancements that integrate multiple strata of information to measure more holistically resilience to improve the resilience of communities. In the absence of such advancements, disparities in resilience will remain uncertain, and decision-making efforts to reduce earthquake impacts may be misguided and fail to promote resilient communities. It is within this context that the Resilience Performance Scorecard (RPS) was developed (Johannes Anhorn, Khazai, & Burton, 2014; Bijan Khazai, Anhorn, & Burton, 2016, in submission). The RPS is a multi-level and multi-scale self-evaluation tool that empowers stakeholders to assess earthquake risk and resilience parameters based on qualitatively derived information using innovative data collection technologies. Six dimensions are evaluated to address key areas of resilience that mainstream risk reduction into planning and decision-making processes: social capacity, awareness and advocacy, legal and institutional arrangements, planning and regulation, critical infrastructure and services, and emergency preparedness and response. The key dimensions of Urban Resilience and their relationship with the ten essentials of a resilient city are depicted in Figure 1.



Figure 1 Six dimensions for mainstreaming urban resilience. From Anhorn et al. 2014.

The urban resilience goals are divided into three strategic goals shown in the chart. Each of the strategic goals corresponds to one or more key dimensions analysed in the Scorecard where these goals are to be implemented. The application of the RPS is useful to evaluate the status, current gaps, and achievements on key dimensions of resilience in a city. Based on the results, it might be possible for relevant stakeholders to discover areas of opportunity. Further efforts are needed to evaluate the resilience of systems within their city, to update resilience enhancement strategies with the participation of public institutions and community leaders, to set benchmarks for resilience enhancement over time, to foster communications between various levels of government, and to develop earthquake risk reduction strategies.

2 OBJECTIVES

To capture local processes for decision-making and to produce relevant indicators of resilience for communities, diverse types of indicators that are representative of the local conditions and context are needed. These types of indicators cannot be computed from publicly available databases (such as those from national censuses) and require the design of targeted surveys. The objective of the RPS is to provide a tool that can capture the key functional and organisational areas of opportunity for urban resilience

enhancement with local government officials as the targeted decision-making body. The latter is a “bottom-up” approach to measuring resilience in which the implementation of the Scorecard requires engagement with stakeholders for the design of the indicators (questions) and targets (answer schemes). It is anticipated that the Scorecard approach will provide a “broad brush” assessment of areas of opportunity to increase community resilience to enable local policy makers and communities to establish priorities for more in-depth analysis, to allocate funds, and to develop emergency and disaster management programs more effectively.

The specific objectives of RPS are to offer community leaders, and city officials a means to:

- better understand and identify key gaps in earthquake resilience at the community and institutional level within their city;
- facilitate discussion between community leaders, stakeholders, and officials regarding their seismic risk and resilience;
- work with emergency services and other agencies on earthquake risk reduction;
- create an agenda to foster the development of detailed risk and resilience assessments based on the identified gaps that could lead to the construction or update of resilience management strategies;
- create benchmarks for monitoring and evaluating resilience and earthquake risk reduction; and take collective responsibility to reduce the impacts of damaging earthquake events.

3 RESILIENCE DIMENSIONS

Following the strategic goals of the Hyogo Framework for Action (now the Sendai Framework for Disaster Risk Reduction) and the UNISDR Ten Essentials of a Resilient City¹, the Resilience Performance Scorecard was developed to address community resilience in key dimensions within a city’s communities and its government’s functional and operational activities. These dimensions are briefly discussed in the subsections below.

3.1. AWARENESS AND ADVOCACY

The Awareness and Advocacy dimension represents the level of awareness and knowledge of earthquake risk within communities and among community leaders and public institutions. Topics include:

- Current status and main achievements in risk assessment and raising public awareness.
- Level of awareness and knowledge of earthquake risk.
- Information about earthquake safety, preparedness, and risk reduction.
- Public outreach activities for disaster safety, preparedness and risk reduction.
- Training and capacity building programs to increase technical and professional resources for earthquake risk reduction.

¹ See: http://www.unisdr.org/files/26462_13.tenessentialchecklist.pdf

3.2. SOCIAL CAPACITY

The Social Capacity dimension is related to the capacities of the population to prepare, respond and recover from a damaging earthquake efficiently. Topics include:

- Availability of healthcare and social assistance programs for vulnerable groups.
- Ties and connections between people among their, e.g. neighbourhood, municipality, district, canton, sub-city, parish, and so forth.
- Social integration considering different economic levels.
- Access to electricity, gas, and clean water.
- Primary education.
- Social integration of minority populations.
- Interaction between formal (governmental) and informal institutions.
- Participation in decision-making.
- Programs for the protection of historic buildings and cultural heritage.

3.3 LEGAL AND INSTITUTIONAL ARRANGEMENTS

The Legal and Institutional Arrangements dimension corresponds to the mechanisms available to advocate earthquake risk reduction in the city. Topics include:

- Status of regulations, ordinances, or incentives for earthquake safety and risk reduction.
- Prevalence of persons with roles and responsibilities for disaster risk reduction.
- Mechanisms of coordination and cooperation for disaster preparedness, safety, and risk reduction.
- Confidence in the central and local government and non-governmental institutions to prepare for, respond and recover from a damaging earthquake.

3.4. PLANNING, REGULATION AND MAINSTREAMING RISK MITIGATION

The Planning, Regulation, and Mainstreaming Risk Mitigation dimension is related to the commitment and mainstreaming of disaster risk reduction through regulatory planning tools in the cities and within its communities. Subject matter covered includes:

- Status and main achievements of planning, regulation and mainstreaming risk mitigation.
- Earthquake resistant building construction codes.
- Reinforcement and retrofitting of private infrastructure.
- Availability and use of earthquake insurance.

3.5 EMERGENCY PREPAREDNESS, RESPONSE, AND RECOVERY

The Emergency Preparedness, Response, and Recovery theme is aimed at better understanding the potential effectiveness and performance of disaster preparedness, response, and recovery activities within a city. Topics within this dimension include:

- Access to goods such as food and water that can be utilized following a damaging earthquake event.
- Prevalence of local centres for implementing and coordinating emergency response and management.
- Standard operational procedures for coordinating emergency rescue and response activities.

- Funds for emergency preparedness, response and recovery operations.
- Human resources and equipment for emergency preparedness, response, and recovery operations.
- Planning for post-earthquake emergency operations.

3.6. CRITICAL SERVICES AND PUBLIC INFRASTRUCTURE RESILIENCE

The Critical Services and Public Infrastructure Resilience dimension was designed to assess the capacity of lifelines and critical facilities to react and continue functioning following damaging earthquake events.

Subject matter includes:

- Structural mitigation to reduce the seismic risk of lifelines and critical facilities.
- Incorporation of nonstructural mitigation to reduce seismic risk within lifelines and critical facilities.
- Business Continuity Planning (BCP) for local government offices in the aftermath of a damaging earthquake.
- Plans for the repair or replacement of critical lifelines in the aftermath of a damaging earthquake event.

The Scorecard was developed to address key issues of urban resilience at multiple levels of geography, from the community to the city level. The key dimensions of the scorecard are consistent across different scales. Instead, some indicators (questions) and targets (answer schemes) along each of the themes within the six dimensions are adjusted to represent the appropriate scale such as for a city's Parishes, Districts (see Figure 2), and for the city as a whole.

Parish Level	Awareness and Advocacy	District - Level
	Social Capacity	
	Legal and Institutional arrangements	
	Risk Mitigation	
	Critical services and public infrastructure resilience	
	Emergency preparedness, response and recovery	

Figure 2 The six dimensions are adjusted to represent the appropriate scale.

From Valcárcel et al. 2016.

4 STRUCTURE OF THE SCORECARD

The purpose of the development and application of the RPS is to provide a tool that can capture the key functional and organisational areas for urban resilience with communities and local government officials as the targeted decision-making body. In this regard, the structure of the Scorecard was developed considering the dimensions listed in the sections above. Each dimension was divided into a set of indicators (questions). Specific questions of the scorecard can be adjusted for the local context of the area being analysed. It is within this context that the dimensions, indicators, and brief explanations of them are detailed in Table 1 to provide a guideline for the development of a scorecard to represent the needs

of the city being analysed. The rationale of each indicator was adopted from the social vulnerability concepts and metrics proposed by Cutter, Boruff, & Shirley (2003) for the Social Vulnerability Index (SoVI).

Table 1: RPS indicators and rationale.

Source: Valcárcel et al. 2016. Adapted from Cutter et al. Cutter et al. (2003).

Indicators	Rationale
Dimension: awareness and advocacy	
Level of awareness and knowledge of earthquake risk	Informed populations may demand the development of risk mitigation projects and may participate in emergency response activities.
Information about earthquake safety, preparedness, and risk reduction.	Adequate channels and mechanisms of communication facilitate the dissemination of relevant information for risk identification, mitigation, and emergency response.
Public outreach activities informing about disaster safety, preparedness and risk reduction	Meetings, presentations, and events regarding earthquake risk allow stakeholders to disseminate relevant information for vulnerability reduction and emergency response. Also, such meetings are useful to raise awareness and create community groups working for their seismic safety.
Training and capacity building programs to increase technical and professional resources for earthquake risk reduction	Trained persons will demand and lead the development of risk mitigation activities within their communities.
Dimension: social capacity*	
Healthcare and social assistance programs available for vulnerable groups	Healthcare providers, including physicians, nursing homes, and hospitals, are important post-event sources of relief. The lack of proximate medical services will lengthen immediate relief and longer-term recovery from disasters
Ties and connections between people	A community with strong ties is more likely to create organisations and working- groups for risk reduction and emergency response, or to depend on each other for earthquake response activities and recovery.
Social integration considering different economic levels	The socioeconomic status of communities determines the ability to absorb losses and enhance resilience from hazard impacts. Wealth enables communities to absorb and recover from losses more quickly due to insurance, and social safety nets. Those people who are dependent on social services for survival are already economically and socially marginalized and require additional support in the post-disaster period
Social integration of minority populations	Race and ethnicity impose language and cultural barriers that affect access to post-disaster funding and residential locations in high hazard areas.

Indicators	Rationale
Dimension: social capacity*	
Access to electricity gas and clean water	The lack of access to sewers, water, gas infrastructure represents a condition of vulnerability and marginalisation.
Primary education	Education is linked to socioeconomic status, with higher educational attainment resulting in greater lifetime earnings. Lower education constrains the ability to understand warning information and access to recovery information.
Interaction between formal and informal institutions	Strong interactions between formal (governmental) and informal institutions could facilitate the development of risk mitigation projects and emergency response plans that include citizen participation.
Participation in decision making	Formal mechanisms of participation of community leaders in decision-making allow the incorporation of community needs in programs for disaster risk management.
Protection of historic buildings and cultural heritage	The protection of cultural values and heritage is a key aspect of preserving the identity of communities.
Dimension: legal and institutional arrangements	
Regulations, ordinances, or incentives for earthquake safety and risk reduction	Legal instruments such as regulations and ordinances usually establish responsibilities, duties, plans, concepts, strategies, and priorities. Therefore, such instruments facilitate the coordination among public institutions, communities and the private sector regarding the development of risk mitigation projects and emergency response activities.
Community leaders with roles and responsibilities for Disaster Risk Reduction	Formal mechanisms of participation of community leaders in decision-making allow the incorporation of community needs in programs for disaster risk management.
Mechanisms of coordination and cooperation for disaster preparedness, safety and risk reduction	
Confidence in the central and local government and non-governmental institutions to prepare for, respond and recover from a damaging earthquake	Confidence in the government facilitates the use of public resources and the participation of communities in the development of risk management programs.
Dimension: planning, regulation and mainstreaming risk reduction	
Earthquake resistant building construction codes	Building codes and their implementation reduces the construction of structures highly vulnerable to earthquake events.
Reinforcement and retrofitting of private infrastructure	The retrofitting of private infrastructure mitigates the physical vulnerability of (residential, commercial) buildings, reducing potential damages and losses in case of events.

Indicators	Rationale
Dimension: planning, regulation and mainstreaming risk reduction	
Availability and use of earthquake insurance	The use of insurance regarding earthquake risk favours the availability of economic resources for recovery and reconstruction activities.
Availability of funding for disaster risk management plans or earthquake mitigation programs	The availability of financial resources facilitates the development of risk identification and mitigation programs.
Dimension: emergency preparedness, response, and recovery	
Population storing goods to be used in case of disasters	Population storing goods will have access to resources required to guarantee minimal conditions of living in emergency situations. Such populations will not depend entirely on the aid and support from the community, the government and public institutions.
Local centres for implementing and coordinating emergency response and management	Centers with adequate resources for emergency coordination facilitates the decision-making process during crises, providing a common space for the communication and the interaction between different actors (public, private institutions, and communities) as well as the access to essential services for people participating in the management of emergencies.
Standard operational procedures for coordinating emergency rescue and response activities	In the case of emergency, protocols and procedures for emergency response are used to define the required participants and resources as well as their roles and responsibilities.
Funds for emergency preparedness, response and recovery operations	The availability of funds for emergency response facilitates a prompt assistance to the affected population, as well as the repair and reconstruction of infrastructure damaged.
Human resources for emergency preparedness, response and recovery operations	The availability of human resources and equipment favours a prompt and effective response in case of emergency.
Equipment for emergency rescue, response, and cleanup operations	
Response plan for post-earthquake emergency operations	Plans for post-earthquake emergency operations are useful to define responsibilities and resources required for a prompt and effective response
Dimension: critical services and public infrastructure resilience	
Assessment, reinforcement, and retrofitting of critical public infrastructures	Facilities such as schools, hospitals, and critical infrastructure such as lifelines provide important services to communities in normal conditions as well as in the case of emergencies. Therefore, the reduction of the structural and non-structural vulnerabilities of such buildings and infrastructure could be promoted to guarantee their operation and functionality during and after earthquake events.
Structural improvements to reduce seismic risk in lifelines	
Business continuity plan of local government offices for the aftermath of a damaging earthquake	Business continuity plans are used to guarantee the operation and functionality of governmental offices after emergencies and earthquake events.

Indicators	Rationale
Dimension: critical services and public infrastructure resilience	
Plans for the repair or replacement of critical lifelines in the aftermath of a damaging earthquake event	The implementation of plans for recovery and reconstruction of lifelines facilities a prompt restoration of the services affected, by defining responsibilities, functionality targets and financial resources required.

5 SCORING SYSTEM

For each indicator, a set of targets (answer schemes) was established to track progress pertaining directly to understanding gaps in earthquake resilience in a city's communities and its organisational, functional and operational systems and processes. In this sense, the implementation of the scorecard requires engagement into a preparatory process where the local context is identified for the design of the indicators (questions) and targets (answer schemes) of the scorecard. The targets were initially defined by using four main categories (B. Khazai et al., 2015):

1-Almost none: "Little or no awareness" This level represents little or no awareness, understanding, and mainstreaming disaster risk within a community or city. There is no institutional policy or process for incorporating risk reduction within the functions and operations of the city or its communities. Further, in some cases, there is an adverse attitude and adverse institutional culture towards adopting measures to reduce risk. As a result, significant resistance is expected from any risk reduction initiative potentially resulting in greater vulnerability and higher losses in the future.

2-Low: "Awareness of needs" This level refers to an early stage of awareness and risk mainstreaming. The city or community has a growing level of awareness, and there is support for disaster reduction among the policy makers. The city and its communities may have activities, and dedicated efforts for preparedness but these are simply limited to response. However, support is limited and does not necessarily carry through at all levels of the local government; resistance to change is expected at various levels where business, as usual, is judged sufficient. In general, the city or communities have no established policy, guidelines or system for mainstreaming, and action will be needed at the highest level to establish such policies and systems. This level is expected not to result in risk reduction in the long term. Vulnerability to earthquakes under these circumstances may increase.

3-Moderate: "Engagement and Commitment." This third category refers to a high level of engagement and commitment to Disaster Risk Reduction (DDR). However, the policies and systems have not been fully established yet. The city/community may not have a deep understanding of the mainstreaming process and requirements, and there may still be limited capacity to increase resilience, but overall there is a willingness to take some action; commitment for change, and in particular to shift from response only to mainstreaming DRR. There may be "pockets of resistance," to mitigation and DRR planning but these are expected to be overcome with time.

4-High: “Full integration” This level refers to a situation where risk reduction and resilience is fully absorbed into planning and development processes as well as core services. The city/community places high importance on reducing disaster risks in a sustainable program of action at multiple levels and within multiple sectors, and there is a comprehensive demonstration of practice. This level describes a situation where disaster risk reduction is “institutionalized”. However, this is not to suggest that an optimum level of attainment has occurred: there is still a need for further progress. The process of mainstreaming should be viewed as open-ended: while organisations should aim to achieve this level, they should also aim to make continuous improvements to their approach.

Within these levels, graduated variations of the following topics were also considered:

- Level of implementation of risk reduction, emergency response and recovery plans
- People participating in disaster risk management programs
- Availability of mechanisms of information, coordination, and communication
- Frequency of and participation in risk management activities
- Coverage of risk management programs, lifelines, and critical services
- Availability of resources for risk mitigation, emergency response, and recovery

For the sake of simplicity, numerical values (1 to 4) were assigned to each category. In this way, the aim was to collaboratively develop and implement an initial scorecard that can affect cities and other stakeholders in understanding potential gaps in resilience, in which strategies can be put into place to fill those gaps, and research can be applied to critical areas where further analysis is needed.

6 TARGET POPULATION

The scope of the RPS is to start the interaction with the stakeholders in the case study area (J Anhorn, Burton, & Khazai, 2014). The target population for the exercise is made up of two main groups of stakeholders, but the number of groups and the composition of these groups can change according to the specific case study area:

- Government officials/Private sector/ Non-Governmental Organizations. The representatives of service providers of water, electricity, gas, communications, public works and medical services. Planning authorities and other city officials from other relevant departments. The representatives of national and international organisations located in the case study area.
- Community leaders. Council members, members of indigenous groups, youth and elderly organisations, and so forth (J Anhorn et al., 2014).

The exercise requires inviting at least two representatives of each entity and three community leaders from each administrative division considered for the exercise, and at least one of them must be a woman, to secure women representation. Nevertheless, in previous exercises, we have experienced difficulties to

structure the groups following this criterion. Therefore, we recommend to structure the invitation list and submit the invitations for the exercise in advance to fulfil this recommendation.

This diverse group of stakeholders represent different interests and have different understandings of “Resilience”. To foster communication across multiple levels depends on the selection of the right stakeholders (J Anhorn et al., 2014).

7 EXERCISE

8.1. DATA CAPTURE

The RPS exercise on-site involves mainly but not only staff from the Social Vulnerability and Resilience (SVR) team in Global Earthquake Model (GEM) Foundation. The logistic of this kind of exercises also requires staff from Information Technologies (IT), communications, and the administrative department. In case that members of GEM are originally from the country where the exercise is going to take place, they will be involved in the exercise, without regards their affiliation into GEM, to take advantage of their local knowledge.

Moreover, the exercise requires also a strong involvement of officials at the disaster management institutions, where the RPS exercises are going to take place. The support from the local organisations is essential for the call of the participants in the exercise. The exercise requires having a moderator from GEM, with the support of an official from the local organisation, ideally the person in charge of the call. The reason is that this official usually knows very well the group. It is necessary that the moderator from GEM will be aware of the national policies, prevention, preparedness and emergency plans, buildings codes, hazard, risk and vulnerability analysis and micro zonation studies previously undertaken in the case study area. Therefore, it would be ideal that the moderator arrives at least three days in advance to the city, where the exercise is going to take place, to collect information and get involved with the representatives of the institutions.

The exercise is undertaken based on three elements, slides, software and devices. The slides include questions according to each dimension, which allows collecting the necessary qualitative data to measure the recovery in the city, as it is possible to observe in Figure 5a. The software used in GEM Foundation was developed by *PowerCom*. The software captures the answers and the affiliations of the Government Officials or the origin of the Community leaders. The data is captured using receivers, please see the figures 5b) and 5c).

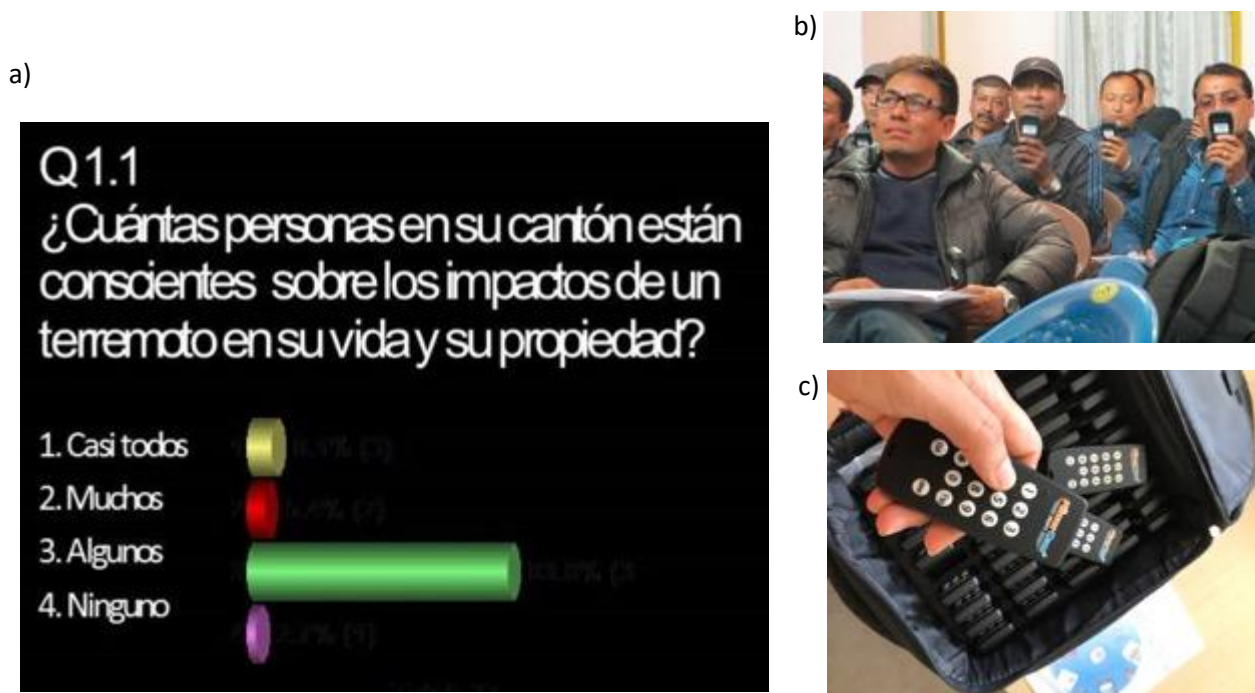


Figure 3 Components of the RPS exercise.

A) Slides with the questions, b) participants answering the questions in Lalitpur (Nepal) and c) receivers.

To explain the mechanics of the exercise and how to use the receivers, we start with simple questions, such as, which was your breakfast today? Moreover, Which is your favourite colour?. These two questions are asked before starting with the relevant questions for the exercise, to explain that there are always four options and they have to select on the receiver the number according to the answer that they consider appropriate for the question.

It is essential for the exercise that somebody who speaks the local language follows and delivers a written report of the discussion. It would be recommendable to record the discussion also in audio and video when it is possible. It is also necessary to take photographs of the group for the sponsors of the exercise, the local supporting organisation and interested participants.

It would be ideal that this exercise will be undertaken at the beginning and at the end of the framework project, to measure the impacts of the project to enhance resilience.

8.2. DATA PROCESS

The collected data is processed and later analysed by performing a frequency analysis of the selected answers, to understand who answer what? Moreover, the reason for his/her answer. The kind of analysis performed is presented in Figure 6.

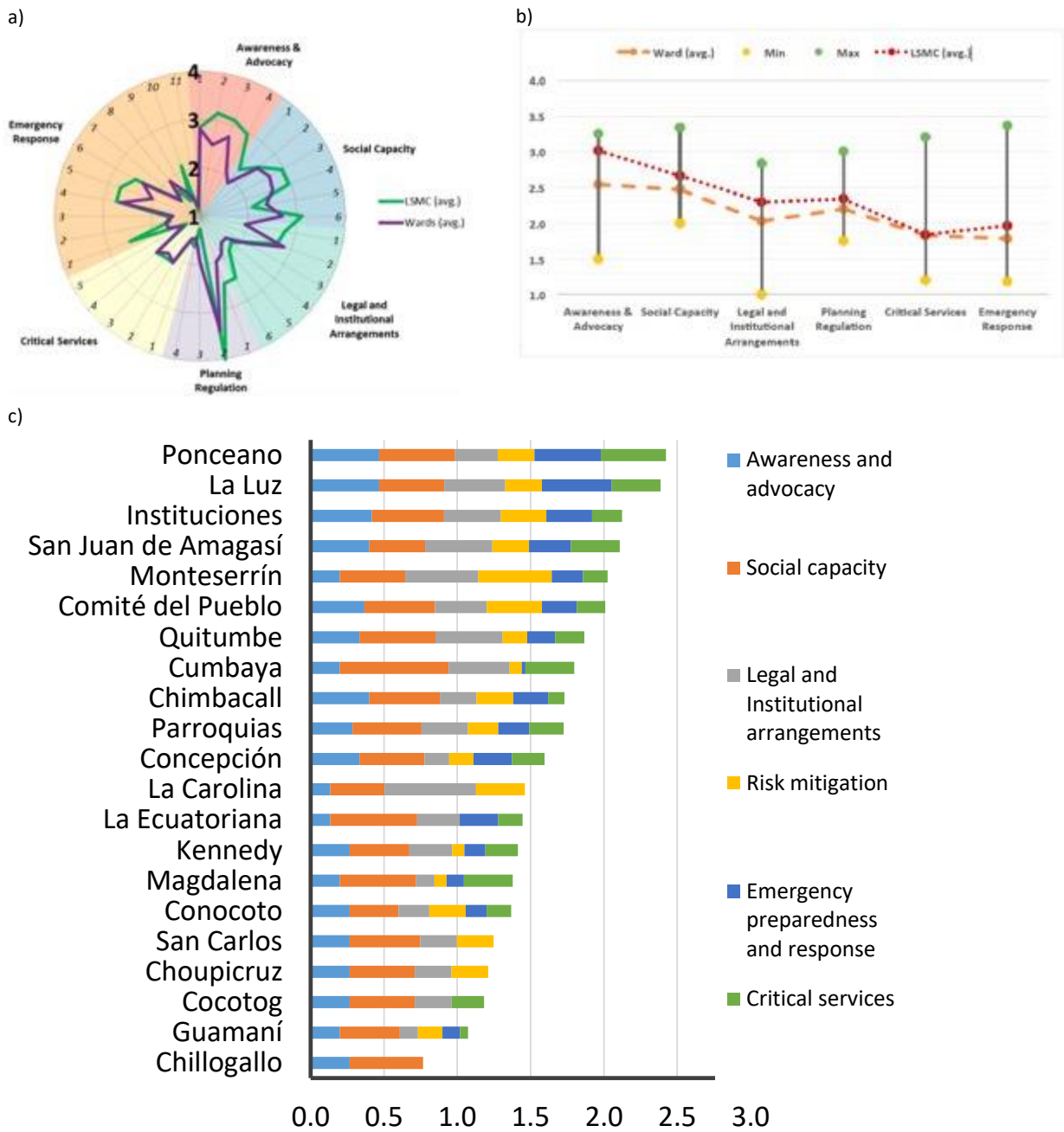


Figure 4 RPS statistical analysis. A) Spider analysis (answers of municipal departments and wards in Lalitpur, Nepal), b) Min, Max, and Mean score of the Municipality per theme in Lalitpur (Nepal) C) Total score by dimensions and Parishes in Quito (Ecuador). From: Anhorn et al. 2014; Valcarcel et al. 2016.

8.3. RESULTS

The processed data is used to determine, why a government official from a specific institution or a community leader from a defined municipality select a specific answer to a question. Based on this analysis is possible to identify gaps and opportunities to improve resilience in the case study area and later to formulate conclusions and recommendations. The main aim of the exercise is to generate

information for policy and decision-makers to take actions oriented to reduce the risk and increase the resilience level in the city.

8 CASE STUDIES

The exercise has been undertaken in Lalitpur (Nepal), Yangon (Myanmar), Addis Ababa (Ethiopia) and San Jose (Costa Rica). The location of the places and images of the workshops can be found in Figure 7.



Figure 5 Resilience Performance Scorecard in the world undertaken by GEM.

The reports are:

- Burton, C., Khazai, B., & Anhorn, J. (2014). Report on the workshop on the participatory evaluation of earthquake risk and resilience in Lalitpur, Nepal.
- Valcárcel, J., Burton, C., & Villacis, C. (2016). Report on the Workshop for the participatory evaluation of earthquake risk and resilience in Quito, Ecuador.
- Musori, M., Contreras, D., Burton, C., Villacis, C., & Dima, B. (2017). Report on the workshop for the participatory evaluation of earthquake risk and resilience in Addis Ababa, Ethiopia.
- Contreras, D., Musori, M. Romero, L., & Salgado, D. (2018). Taller para la Evaluación Participativa de la Resiliencia en San José de Costa Rica (in writing).

REFERENCES

- Anhorn, J., Khazai, B. & Burton, C.G. (2014). *Report on the workshop on the participatory evaluation of earthquake risk and resilience in Lalitpur*, South Asia Institute, Center for Disaster Management and Risk Reduction, Global Earthquake Model.
- Anhorn, J., Burton, C., & Khazai, B. (2014). *A monitoring & evaluation tool to engage local stakeholders*. Paper presented at the Resilience Cities 2014 Congress.
- Anhorn, J., Khazai, B., & Burton, C. (2014). *Report on the workshop on the participatory evaluation of earthquake risk and resilience in Lalitpur*. Retrieved from
- Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social Science Quarterly*, 84(2), 242-261. doi:10.1111/1540-6237.8402002
- Khazai, B., Anhorn, J., & Burton, C. (2016). *Participatory evaluation of disaster resilience performance with urban stakeholders: An implementation case study before and after the 2015 Nepal Ghorka earthquake*. Paper presented at the Fall General Assembly 2016.
- Khazai, B., Anhorn, J., & Burton, C. (in submission). Resilience Performance Scorecard (RPS). *International Journal of Disaster Risk Reduction*.
- Khazai, B., Bendimeard, F., Cardona, O. D., Carreño, M. L., Barbat, A. H., & Burton, C. B. (2015). *A Guide to measuring urban resilience. Principles, tools and practice of urban indicators: EMI*.
- Pacione, M. (2005). *Urban Geography: a global perspective* (Second Edition ed.): Routledge.
- UNISDR. (2009). *Disaster Risk Reduction* Geneva, Switzerland: UNISDR.
- Valcárcel, J., Burton, C., & Villacis, C. (2016). *Report on the Workshop for the participatory evaluation of earthquake risk and resilience in Quito, Ecuador*, Pavia, Global Earthquake Model.