

ASSESSING ENVIRONMENTAL IMPACTS DURING NATURAL DISASTER: THE DEVELOPMENT OF A RAPID ENVIRONMENTAL ASSESSMENT METHODOLOGY

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The linkages between disaster and environmental damage are recognized as important to predicting, preventing and mitigating the impact of disasters. Environmental Impact Assessment (EIA) procedures are well developed for non-disaster situations. However, they are conceptually and operationally inappropriate for use in disaster conditions, particularly in the first 120 days after the disaster has begun. The paper provides a conceptual overview of the requirements for an environmental impact assessment procedure appropriate for disaster conditions. These requirements are captured in guidelines for a Rapid Environmental Impact Assessment (REA) for use in disasters. The REA guides the collection and assessment of a wide range of factors which can indicate: (1) the negative impacts of a disaster on the environment, (2) the impacts of environmental conditions on the magnitude of a disaster and, (3) the positive or negative impacts of relief efforts on environmental conditions. The REA also provides a foundation for recovery program EIAs, thus improving the overall post disaster recovery process. The REA is designed primarily for relief cadres, but is also expected to be usable as an assessment tool with disaster victims. The paper discusses the field testing of the REA under actual disaster conditions.

Keywords: Disaster relief; environmental impact; methodology.

Introduction

Until recently, there was no specific format for the assessment of environmental impacts in disasters. This gap has been filled with the development of the *Guidelines for Rapid Impact Assessment in Disasters* (www.bghrc.com, under

Disaster Studies). The *Guidelines* are intended primarily for use in lesser developed countries, but are generally applicable to any rapidly evolving crisis-type situation when immediate action is needed and long term data collection and analysis are not possible.

The development of the *Guidelines* is a collaborative effort of the Benfield Greig Hazard Research Centre, University College London and CARE US and CARE Norge. Support for the project has come from the United Nations Environment Program (www.reliefwebint/ocha_ol/programs/unep.index.html) and the Norwegian Ministry of Foreign Affairs (via CARE Norge).

This paper provides (1) background on the need for a rapid environmental impact assessment methodology and the development of the *Guidelines*, (2) a summary of a recent field test of the *Guidelines* in Afghanistan and (3) plans for further testing of the *Guidelines* and development of a training module covering the *Guidelines*. Further information on the *Guidelines* and supporting project can be found at www.bghrc.com under Disaster Studies. This paper draws on previously published work by the author (see Kelly: 2001, 1999, 1996).

Disaster-Environment Context

Disasters are social events normally associated with some trigger event and resulting in conditions which are beyond the capacity of the affected population to adequately cope (see Quarantelli). In a disaster, there is a need to take urgent action to save lives, prevent or minimize the loss of property and damage to individual and social well-being.

Disaster planning is intended to help organize the response process before and during a disaster. But, in most cases, disaster response involves a high degree of uncertainty, with a need to take action based on incomplete information and without a full understanding of the needs of disaster victims, or the impacts of the event and the assistance provided.

Disasters are also characterized by a combination of victim-base and externally-based relief and recovery efforts. It is generally accepted that a large part of the relief and recovery after a disaster is undertaken by the victims themselves, while external assistance may be as important psychologically as materially.

In most disaster response situations, victims and assistance providers make explicit or implicit decisions to focus on only a few types of critical activities. The scale and scope of these activities are limited to live saving at the immediate onset of a disaster, and expand as a disaster moves into recovery and rehabilitation periods. The selection of activities initiated in the period following a disaster is based on a combination of perceived need and familiarity with a specific type of activities or relief/recovery concepts on the part of the victim or assistance provider.

The need to consider environmental issues in responding to a disaster is based on four potential environment-disaster relationships:

1. The hazard which triggers a disaster may have its origin in environmental conditions.
2. Relief and recovery operations may have avoidable negative impacts on environmental conditions.
3. Relief and recovery activities may have potential positive impacts on environmental conditions.
4. Misunderstanding or incorrectly prioritizing environment-disaster linkages may result in limited resources being directed to less important problems. This can result in increased hardship and slower recovery than would be the case if response activities were correctly prioritized.

One or all of these linkages, which impact the effectiveness of a disaster response effort, may exist in any one disaster.

Experience indicates that two conditions need to be met before environmental issues are considered in the early stages of responding to a disaster. First, there must be an awareness on the part of the victims or external responders of the importance of the environment with respect to the disaster impact and recovery process. Second, those dealing with the disaster must be able to identify and treat environmental issues as part of the disaster response. These conditions are not always met. In particular, victims and external responders usually lack the experience and tools to identify the salient environmental issues in the midst of the fast-paced, information and time-limited and chaotic conditions which exist after a disaster.

Environmental Impact Assessment in Normal and Disaster Contexts

Box 1 contrasts environmental impact assessment parameters in developmental (normal) and disaster contexts. Essentially, a normal environmental impact assessment (EIA) is a comprehensive, deliberate and measured collection and weighing of data to identify and evaluate the positive and negative impacts of an undertaking which may have a significant impact on the environment. The bottom line for a normal EIA is whether the anticipated negative impacts are outweighed or acceptably counterbalanced by positive impacts.

In contrast, it is generally accepted that normal rules and procedures should not stand in the way of responding to a disaster, in the way of saving lives and property. In some cases, damage to the environment is acceptable if it saves lives. An assessment of environmental impact under disaster conditions needs to place

Box 1. Contextual differences: Developmental & disaster environmental assessments.

<i>Development</i>	<i>Disasters</i>
<ul style="list-style-type: none"> • Legal requirement often exists (country &/ or donor) • Deliberate & pro-active • Will take time, be thorough & extensive: comprehensive data collection • “No project” option is a possible outcome • Project launch planned • Location chosen • Duration planned • Beneficiary population identifiable & static • Environmental goals may be made compatible with socio-economic ones 	<ul style="list-style-type: none"> • Rarely a legal requirement but some donor may ask for it • Reactive • May need to be partial in coverage • “No project” outcome is not an option • Sudden onset • Unpredictable location • Uncertain duration • Beneficiary population heterogeneous & dynamic • Priority given to “life saving” activities sometime difficult to reconcile with environmental goals

Source: CARE USA and UNHCR.

impacts in the context of saving lives and maintaining well being. This means that there is a significant conceptual and procedural difference between doing an EIA in normal and disaster conditions.

Procedures and standards for conducting an EIA are well established. The International Association of Impact Assessment has established a set of *Principles of Environmental Impact Assessment Best Practice*, and an index of EIA web sites (see www.iaia.org). There is a significant body of literature on how to conduct an EIA, including procedures appropriate for low technology situations (see FAM).

Efforts have been made to reformat normal EIA procedures for use in disasters (see Salih and Guha-Sapir, and Lee). Since the process remains based on the comprehensive and deliberate process at the core of a normal EIA there is a significant risk that the resulting EIA will be based on incomplete data and analysis. The resulting misstatement of environmental issues can cause a misdirection of limited emergency assistance to actions which may be, in reality, of low priority and have a negative impact on the overall recovery effort (Kelly, 1996).

The UNHCR has probably gone furthest in developing purpose-specific materials on environmental impacts associated with one type of disaster impact, displaced populations (see www.unhcr.ch under Environment). These materials, intended for refugee situations, can be applied to other types of population displacement. The material is, however, of limited use in other types of disasters where displacement is not a significant impact or outcome.

The Rapid Environmental Impact Assessment Project (a joint Benfield Greig Hazard Research Centre/CARE US, CARE Norge undertaking) has taken a different approach, developing a Rapid Environmental Impact Assessment (REA) specifically for use in disaster conditions. The REA is intended to provide:

- An analysis and decision framework based on the prime objectives of saving lives and reducing damage,
- A linkage of environmental issues to these objectives.

In addition, the REA is designed to be:

- Dynamic, able to provide information for a real-time monitoring of environment-related factors as input into ongoing assistance operations.
- Simple and straightforward, imposing the least additional workload on the response effort.
- Applicable over a wide range of agro-ecological, geographic, and socio-cultural and economic settings.

The REA is intended to be used from shortly before the onset of a disaster to up to 120 days after a disaster. Operations normally shift to rehabilitation and reconstruction at or before 120 days after a disaster, by which time a normal EIA and environmental data collection system can be instituted and the REA would phase into this normal structure.

The REA process has been formulated into a *Guidelines for Rapid Environmental Impact Assessment in Disasters*. The development of the *Guidelines* was financed by the United Nations Environment Program and supported by an advisory group of disaster management and environmental professionals representing most regions of the world.

Guidelines for Rapid Environmental Impact Assessment in Disaster

Concept and format

The *Guidelines* are designed for non-specialists and follow a logical six step process of identification and prioritization of potentially salient environmental issues related to the location and trigger events of the disaster and the possible impacts of assistance efforts. The *Guidelines* are considered to be a *best practice* document, to be revised based on use and feedback. The most current version of the *Guidelines* can be found at www.bghrc.com under Disaster Studies.

The purpose of the *Guidelines* is not to fully define the nature and relevancy of all environmental issues, but *to identify which issues are considered most*

important and require further investigation or action. This approach is similar to the iterative data collection and analysis process used in other types of disaster impact assessment and planning.

The first five elements of the *Guidelines* are based on data collection forms or rating tables to be completed by the user or users. The sixth element is a table developed from the results of the preceding five elements. Table 1 below¹ summarizes the elements and outcomes of the six elements *Guidelines* and sections of each element are provided in Annex A².

Note that the *Guidelines* are designed for use in natural, technological or conflict disasters. As a result, several of the rating tables contain sections which may not be applicable to a specific disaster.

Table 1. *Guidelines* elements and outcomes.

Elements	Outcomes
Context Statement	Disaster summarized. Perceived environmental issues, information sources, need for further assessment/ information and environmentally unique disaster-related assistance requirements identified.
Identification of Disaster Related Factors With Immediate Impact on the Environment	Factors requiring attention to mitigate or avoid negative environmental impacts identified and prioritized.
Identification of Possible Immediate Environmental Impacts of Hazards	Significant immediate threats to lives and well being identified and prioritized.
Identification of Unmet Basic Needs	Unmet needs with likely environmental impact identified and prioritized.
Identification of Potential Negative Consequences of Possible Relief Activities	Negative impacts of, and possible changes to, ongoing or planned activities identified and prioritized.
Synthesis Action List	Prioritized list of critical issues and actions to address these issues. Issues which may require action after the relief phase are also identified.

¹Table 1 is an edited version of a table contained in the *Guidelines*.

²Due to space limits, only parts of the element rating forms are provided in Annex A. The complete forms can be found as part of the *Guidelines* at www.bghrc.com under Disaster Studies.

The rating and evaluation in the *Guidelines* is a mixture of qualitative and quantitative measurements. This mix reflects the expected lack of comprehensive data during a disaster and the lack of time to establish extensive data collection systems.

The *Guidelines* can be completed by an individual, but are more productive and comprehensive as a group effort. The initial use of the *Guidelines* in a disaster is intended to take no more than two hours of preparation and two hours for completion in a group setting. However, actual time needed for preparation and completion depends on the complexity of the disaster and response effort.

The completion of the forms in the *Guidelines* can lead to five types of follow-up actions:

1. A quick resolution of issues through minor changes to assistance activities,
2. A decision to redesign assistance activities to address significant environmental issues,
3. Recourse to local or external sources for information on how to address complex environmental issues,
4. Collection of additional information to better define the importance of specific issues of concern, and,
5. Advocacy for action on environmental issues which are beyond the scope or mandate of the organization doing the assessment.

Management of the follow-up actions depends on an organization's policies and operational mandates. It is likely that most organizations conducting an assessment will not be able to respond directly to all salient issues raised. This is where advocacy is an important component of any organization's follow-up efforts, wherein an assessment by one organization had help set the environmental response components of other organizations.

Ideally, the initial assessment would be reviewed and revised on a regular basis during the disaster, new issues identified for action and efforts to address old issues assessed for effectiveness. A regular revision of the assessment would provide initial input into a reconstruction EIA and a formal post-disaster environmental monitoring system.

Field testing results

A field test of the *Guidelines* was conducted in Afghanistan in February–March 2002. The test was conducted in collaboration with an international non-government organization with several decades of experience in Afghanistan and a large and diverse portfolio of relief and recovery projects. The test was run by

the author and used a group of ten staff as participants to complete the REA process and follow-up on issues identified.

Key results of the field test include:

- The *Guidelines* identified critical environmental issues. However, some of the forms and format in the *Guidelines* need improvement.
- The assessment process is more difficult to accomplish for multi-sector and geographically diverse assistance operations. Complex programs require more time and resources to complete the assessment.
- Elements of the *Guidelines* can be effective stand-alone tools for screening current or planned projects.
- Translating the issues into actions can be difficult and may require a full time position dealing with environmental issues.
- A lack of information hampered the assessment and finding solutions to issues identified.
- Streamlining the assessment process is a priority for field personnel.
- Superior english language skills are a key part of making the assessment “rapid”. (The *Guidelines* were only available in English.)
- The assessment process served a double role of assessment and education.
- The assessment largely focused on male-oriented issues.

A full report on the field test can be found at www.bghrc.com under Disaster Studies.

Next Steps

Further field testing

An additional two field tests are planned for the *Guidelines*. At least one of these tests will be in a natural disaster and one of the two will be conducted in collaboration with a parallel effort to develop a system for seed sector assessment following a disaster. Options under consideration include testing the *Guidelines* at sub-national level and with disaster affected communities. The results of these tests will be posted to www.bghrc.com when they are completed.

Training module development

Once the field tests are completed, the project plans to develop and test a training module on the REA and *Guidelines*. This module is considered a key mechanism to expand the number of people who are aware of environment-disaster linkages and procedures for environmental impact assessment in disasters. The project

expects this training module to be international and local non-government agencies in staff training on disaster management. In addition, the training module will be available as a self-training course on the project web site.

Dissemination

The project is actively disseminating information on the REA and *Guidelines* through the project web site (www.bghrc.com under Disaster Studies), personal contacts and public forums. An ultimate intent of the project is for the *Guidelines* to become a best practice tool in disaster impact needs assessment and planning.

Conclusions

This paper has summarized the development of a Rapid Environmental Impact Assessment process for use in disasters. This process, formalized in *Guidelines for Rapid Environmental Impact Assessment in Disasters* (www.bghrc.com under Disaster Studies), provides a structured procedure for identifying salient environmental issues which may exist in a disaster and monitoring changes in environmental conditions during disasters. The *Guidelines* document is designed to be used by non-specialists and provide results which are easily linked to the key objects of disaster response, of saving lives, limiting damage and maintaining welfare.

The *Guidelines* have proved to be largely effective in identifying salient issues during a recent field test. However, additional work is needed to make the *Guidelines* document more user-friendly and gender sensitive. In addition, improved access to information is needed by those completing the assessment to better define salient environmental issues and develop solutions to these issues.

Additional field testing of the *Guidelines* will identify further improvements in the REA process developed to date. These improvements, and the development of a training module and dissemination efforts, can be expected to help establish the *Guidelines* as a best practice tool for environmental impact assessment in disasters. This best practice tool can make overall disaster management efforts more effective by permitting response personnel and disaster victims to explicitly and systematically include the environment in relief planning and operations, something which has not been the case in the past.

Annex A: Guidelines Rating Forms — Selected Sections

Element One

Context Questions

1. Provide two short paragraphs covering (1) cause/s and most evident impacts of the disaster and whether the weather or other conditions at the disaster site will change and if these changes will affect environmental conditions and relief needs, and (2) priority disaster relief efforts and specific programmatic areas of interest to the party completing the REA.
2. What sources are likely to be able to provide information on the environment in the area affected by the disaster? Provide contact information and a description of the information available if possible.
Sources to consider:
 - Affected communities and key local resource persons.
 - Local, regional and national government environment, development and planning offices.
 - Trade associations (local, national and international).
 - Local industry.
 - Universities, including programs covering the Environment, Agricultural, Development, Urbanization, Planning, Geography, and Public Health, among others.
 - NGOs, particularly local and international environmental NGOs.
 - UN System, particularly UNEP, UNDP, WHO (health and sanitation), FAO (agro-chemicals and agro-bio-diversity information), ILO (worker health), UNICEF (women and children) and others.
 - Donors with development projects in the disaster area, including international financial organizations (e.g., World Bank, Asia Development Bank).
3. Have there been, or are there currently, concerns about the release of potentially toxic substances? If yes, summarize the information available and indicate how additional information can be collected.
4. Are there environmentally unique sites in the disaster area and have any been (or may be) affected directly or indirectly by the disaster?
5. Are there any concerns about the environmental impact of the disaster on the part of the victims or neighboring communities? Briefly describe the nature and cause of the local concern and link to the disaster for each problem noted.
6. Are there any local or national laws, or donor or organizational policies and procedures which impact how environmental issues will be assessed or managed? If yes, summarize the requirements and how they will be addressed.

Element Two

Rating Form No. 1: Factors with Immediate Impact on the Environment

Factor	Range	Rating	Implication
Number affected	Low (1) to High (10)		The greater the number affected the greater potential impact on the environment.
Duration: Time since onset of disaster.	Short (1) to Long (10)		The longer the disaster the greater the potential impact on the environment.
Density of the affected population.	Low (1) to High (10)		The more dense the living conditions of the victims, the greater the potential impact.
Distance disaster victims have moved after the disaster.	Short (1) to Far (10)		The further victims have to move, the greater the potential impact on the environment.
Self-Sufficiency: The ability of victims to meet needs without recourse to additional direct extraction from the environment or external assistance.	High (1) to Low (10)		Low self-sufficiency implies greater risk of damage to the environment.
Social solidarity: Solidarity between disaster victims and between victims and non-affected populations.	High (1) to Low (10)		Low solidarity may indicate the likelihood of conflict over resources and limits to the ability of victims to meet needs.
Cultural homogeneity: The degree to which disaster victims hold similar cultural beliefs among themselves and with neighboring non-affected populations.	High (1) to Low (10)		A lack of common cultural structure may result in disagreement over resource use.
Asset distribution: The distribution of economic and other assets within disaster affected population.	High (1) to Low (10)		Concentration of assets with one part of a population can lead to tensions with less-well endowed groups over use of environmental assets.
Livelihood base diversity: Degree of diversity in the way livelihoods are assured.	High (1) to Low (10)		A less diverse livelihood base can indicate victims have fewer options and need to use environmentally damaging actions to meet livelihood expectations.
Expectations: The minimum standard of living acceptable to the victims.	Low (1) to High (10)		In the absence of adequate assistance, high expectations can lead to high demand on local resources.

Element Three

Rating Form No. 2: Identification of Possible Immediate Environmental Impacts of Disaster Agents³

Hazard	Threat	Guidance as to Significant Threat Threshold	Threat? Yes (2) Unknown (1), No (0)	Area Affected Large (3) Medium (2) Small (1)	Impact Score (Threat rank x Area Affected)	Initial Response Options
1. Flooding, including sea surge.						
2. Transport of contaminated sediment.	Sediment contains hazardous organic or inorganic chemicals (including high levels of salt).	Chemicals (including salt) present at levels exceeding acceptable standards.				<ol style="list-style-type: none"> 1. Identify and assess level of chemicals present. 2. Limit use of water sources with contaminated sediment and plants and animals collected from these sites. 3. Specialized technical assistance likely needed for assessment and planning.
	Secondary risk from sediment when dried after a flood.	Chemicals present at levels exceeding acceptable standards.				<ol style="list-style-type: none"> 1. Identify and assess level of chemicals present. 2. Limit or avoid use of sediment, and plants and animals collected from sediment sites. 3. Limit movement of dust from dried sediment. 4. Specialized technical assistance likely needed for assessment and planning.

³Note that hurricane/cyclone/typhoon should be treated under each impact agent: flooding, sea surge, and wind.

Element Four

Rating Form No. 3: Unmet Basic Needs

Basic needs and indicator statements by which to determine whether needs met (*indicates Sphere Standard)	Needs being met: 1 (not being met) to 10 (being met)	Sustainable? (Yes/No)
Water* 1. 15 litres of water per person per day.		
2. Flow at water collection point at least 0.125 litres per second.		
3. 1 water point per 250 people. are being		
4. Distance from shelter to water point no more than 500 meters.		
5. Water is palatable and of sufficient quality to be used without significant risk to health due to water-borne diseases, or chemical or radiological contamination from short term use. (Note: includes human and industrial waste and pesticides.)		
Shelter* Average of 3.5-4.5 square meters of covered space per person providing protection from weather and sufficient warmth, fresh air, security and privacy.		
Heating or cooling 1. In hot climates, shelter materials, construction and ventilation adequate to keep in-shelter temperature 10 degrees centigrade below outside temperature.		
2. In cold climates, shelter material, construction, and heating ensures internal temperature no less than 15 degrees centigrade.		
Clothing* Clothing is appropriate for climatic conditions, gender, age, safety, dignity, and well-being.		
Food* 1. 2,100 kilo-calories per person per day.		
2. 10-12% of total energy from protein.		
3. 17% of total energy from fat.		
4. Food distribution is equitable, fair and covers basic needs (together with other food items available).		
5. Adequate micro-nutrient intake.		

Element Four (Continued)

Basic needs and indicator statements by which to determine whether needs met (*indicates Sphere Standard)	Needs being met: 1 (not being met) to 10 (being met)	Sustainable? (Yes/No)
<p>Fuel*</p> <p>1. Fuel availability meets immediate needs.</p>		
<p>2. Fuel-economic and low smoke wood stoves, gas or kerosene stoves and cooking pots with well-fitting lids are available.</p>		
<p>Lighting</p> <p>Sufficient to meet security requirements and for normal economic and social activities.</p>		
<p>Household Resources*</p> <p>Each household unit has access to adequate utensils, soap for personal hygiene and tools. (Specific minimum needs identified in Sphere Handbook Chapter 4, Section 4).</p>		
<p>Transport</p> <p>1. Adequate to deliver goods and services to displaced at reasonable cost and convenience.</p>		
<p>2. Adequate to permit disaster victims to reach goods and services at reasonable cost and convenience.</p>		
<p>Personal Safety*</p> <p>1. Disaster victims have sufficient personal liberty and security at all times.</p>		

Element Five

Rating Form No. 4: Potential Negative Consequences of Possible Relief Activities

Intervention	Undeveloped Or Planned?	Potential Negative Consequences	Selected Avoidance or Mitigation Options	Already Addressed?
Water Supply		<ol style="list-style-type: none"> 1. Increased opportunities for disease transmission. 2. Increase in population density. 3. Overuse of ground or surface water supplies. 	<ol style="list-style-type: none"> 1. Establish and maintain water treatment system. 2. Design and maintain water supply structure to minimize standing water and vector breeding sites. 3. Plan water provision based on anticipated need and sustainable land use plan for delivery area. 4. Establish water resource use plan and monitor use and supply. 5. Consider economic incentives to conserve water. 	
Sanitation, including latrines, waste treatment and transport infrastructure, and solid waste management.		<ol style="list-style-type: none"> 1. Creation of hazardous waste sites. 2. Pollution of land, water and air. 3. Increased disease transmission and presence of disease vectors. 	<ol style="list-style-type: none"> 1. Establish and maintain sites for sanitary and safe waste disposal operating at international standards. 2. Limit waste movement through appropriate collection systems meeting accepted best practices. 3. Minimize opportunities for disease transmission and vectors. 4. Establish and maintain environmental monitoring program covering air, land and water pollution. 	

Element Five (Continued)

Intervention	Undeaway Or Planned?	Potential Negative Consequences	Selected Avoidance or Mitigation Options	Already Addressed?
Health Care		<ol style="list-style-type: none"> 1. Pollution from disposal of medical and other waste. 2. Increased demand for traditional medical herbs and plants. 	<ol style="list-style-type: none"> 1. Establish system for safe disposal of all wastes (solid and liquid). 2. Develop a resource management plan for harvesting of local medicinal herbs and plants. 	
Industry (new or re-starting)		<ol style="list-style-type: none"> 1. Air, soil and water pollution. 2. Unplanned and unmitigated solid and liquid waste disposal. 3. Increased road and other traffic. 4. Increased population and demand for services. 5. Increased and unsustainable resource extraction. 	<ol style="list-style-type: none"> 1. Develop pollution mitigation and abatement plans, incorporating financial incentives where appropriate. 2. Develop site use plans incorporating transport and population support needs based on level of industrial operation. 3. Develop plans for the supply of services (e.g., water, education) for expected population in industrial area. 4. Develop and implement a sustainable resource use plan for target industry. 	

Element Six

REA Synthesis Action List Form

Element and Top Priority Issues	Action Required	Priority	Due Date	Person or Group Responsible
Context Statement				
Factors With Immediate Impact on the Environment				
Possible Environmental Impacts of Hazards				
Unmet Basic Needs				
Potential Negative Consequences of Assistance				
Other Critical Issues				

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