



INTERNATIONAL WORKSHOP

**GLOBAL CHANGE,  
SUSTAINABLE DEVELOPMENT  
AND ENVIRONMENTAL MANAGEMENT  
IN CENTRAL ASIA**

**20 – 22 January, 2004  
Tashkent**

**SYNTHESIS & FINAL REPORT**

# INTRODUCTION

## Background

Central Asia covers some 4 million km<sup>2</sup> with a population of around 45 million people. Physical and geographical conditions in this region vary greatly, and in many parts of Central Asia intensive human activities have resulted in meso-scale change of climate and ecosystems. A well-known example is the large-scale ecological disaster in the vicinity of the Aral Sea, which was once the fourth-largest inland body of water on Earth now on the verge of extinction as a result of the sea drying.

Everywhere in the region, the causes or and responses to global change are superimposed on natural variability. Recognizing that resource management decisions may have strong direct as well as indirect impacts, positive or negative, on the region's environment and prospects for sustainable development, development programmes on a case by case basis need to assess the role of each of these factors and understand the potential impact of measures that modify human activities on ecosystems. For example, water availability, as in all the drylands of the world, is one of the major problems in the Central Asia region. Interruption, decrease or mismanagement of water supplies can lead to national and transboundary security problems in the region. Consequently, there is a need to improve the understanding of the complex interactions and impacts of global and regional environmental changes on ecosystems and human activities in the Central Asia region. This knowledge will help guide decision-making processes geared toward regional sustainable development.

Many studies have already been made, but these need to be collated and analysed in an integrated manner. Thus, an interdisciplinary co-operative regional research agenda needs to be developed, relying on existing knowledge (contemporary and traditional), and one that addresses sustainable development and environmental management goals.

## Organization and sponsorship

- Asia-Pacific Network for Global Change Research (APN)
- Global change SysTEM for Analysis, Research, and Training (START)
- MEDIAS-France
- UNDP/Government of Uzbekistan Environment Programme (Atrof Muhit)
- State Committee for Nature Protection of the Republic of Uzbekistan

## Goals and objectives of the Workshop

- To raise awareness of the APN and opportunities that heightened awareness presents for regional collaboration in research, the application of that research, and capacity building;
- To raise awareness on the programmes and activities of the ICSU-related global change science programmes (START and its co-sponsors IGBP, WCRP, IHDP and DIVERSITAS), and identifying existing linkages as well as explore potential linkages to the scientific community of Central Asia;
- To identify and review the status of global change activities in Central Asia, and identify priority knowledge gaps that may serve as the basis of future research and capacity building activities in the region;
- To summarize the understanding of the complex mechanisms of interaction between global environmental change and its impacts on ecosystems and human society in the Central Asia region;
- To discuss future directions for global change studies in the Central Asia region and help define priorities;
- To help define a relevant regional agenda focused on global environmental change issues;
- To identify potential funding sources for future projects,
- To encourage regional networking; international cooperation and close linkages with APN, MEDIAS-France, international scientific organizations, START and its four co-sponsors (IGBP, WCRP, IHDP and DIVERSITAS).

## **Programme overview.**

**An opening ceremony**, chaired by Dr Martin Rice (APN), was dedicated to the presentation of some key international actors and their actual and planned activities in Central Asia:

- Martin Rice presented APN,
- Dennis Ojima presented START on behalf of its Director who could not come,
- Antoine Sempere represented a ten years revue of INTAS regional initiatives in the fields of climate change and environment,
- Gérard Begni presented the current initiatives and possible strategies to build up a dedicated regional network,
- Iain Muse presented the ARALNET cluster aimed at facilitating a common ground of methodology.

**The first session** was dedicated to Climate change and was chaired by Dr Svetlana Nikulina (Atrof Muhit - UNDP/Government of Uzbekistan Environment Programme).

**The second session** was dedicated to Land use, regional ecosystems and biodiversity and was chaired by Dr. Dennis Ojima (Colorado State University/IGBP, USA)

**The third session** was dedicated to Air pollution and atmospheric composition change and was chaired by Pr. Evgueni Gordov (SCERT, Russia)

**The fourth session** was dedicated to Water resources, quantity and quality and was chaired by Pr. Victor Dukhovny (Scientific Information Centre of Interstate Coordination Water Commission, Uzbekistan).

**An Overall Discussion and Summarizing session** was chaired by Dr. Gérard Begni (MEDIAS-France). It was organized in two parts.

- During the first part, four breakout groups were organized, corresponding to the themes of the four sessions, and bringing together the presenters of the session under the presidency of the session chairperson. They were asked to draw conclusions and recommendations under a common framework previously presented and circulated see Annex 1).
- During the second part, each chair person (or a representative person) presented the conclusion and recommendations of the breakout group. A general discussion followed. The chairman presented some preliminary conclusions and recommendations that appeared to emerge from the discussions and recommendations of the breakout groups, to be further elaborated in the present document.

So, the forthcoming four chapters will present the thematic synthesis, while the last chapter will present the tentative synthesis that can be drawn up from these approaches and from the debates of the last session. It should be kept in mind that interdisciplinary synthesis is always a work in progress. The most important outcome of the workshop is that the regional scientists could get an overarching vision of the intricate issues raised by regional sustainable development and be convinced that both an interdisciplinary approach was mandatory to bring a sound scientific answer to the questions raised.

## **Attendance**

60 outstanding specialists and programme managers in the relevant fields were registered. The list can be found in Annex 3. A few number of them could not attend, or partially attended, for administrative reasons or professional constraints. The audience to each session can be evaluated to some 40 to 50 people. The sessions were quite alive. Attendance raised a lot of questions, evidencing various opinions and approaches of the important issues under discussion, and above all the fact that these questions raised severe concerns for them. Most often, the chairpersons were obliged to go ahead and suggest to use coffee breaks or other opportunities to deepen the questions raised.

Participants expressed their warm congratulations and thanks to Dr. Svetlana Nikulina and all the staff that worked with her for all their efforts in organizing that international workshop – the first one of its kind – and make it an outstandingly successful international event.

# SESSION 1 : CLIMATE CHANGE

## Importance of the theme

It is known that global climate change impacts on the regional climate system, namely:

- Water resources formation and use,
- Increase of aridification in plain part of the region,
- Extension of desertification and land degradation processes,
- Agro-climatic conditions (both positive and negative),
- Ecosystems,
- Frequency and intensity of natural disasters,
- Human health and diseases, Human thermal stress, Socio-economical sectors (indirectly due to food reduction, water quantity and quality etc.).

## State of the art to-day

All countries of the region are Parties of the UNFCCC and fulfil their obligations under this Convention along with the following frameworks:

- Climate change studies are conducted in each country,
- Initial National Communications and Action Plans are issued,
- Preliminary climate change scenarios are constructed in each country with different approaches.

## Gaps to be filled

- The global change is superposed to meso-scale change due to human activities so it is necessary to try to separate the global change signals and local anthropogenic ones.
- In spite of all effort of scientists and studies done it is still necessary to reduce regional climate scenarios uncertainties, especially for precipitation.
- There is a rather big difference between the input results of different groups of climate change researchers from the various countries of the region, so the methodology and inputs should be unified to avoid a large discrepancy in the most possible regional climate change scenarios.
- The climate change research is greatly advantaged when compared to climate impact studies. So, climate impact studies should be methodologically extended. For example leading impact studies in agriculture could be beneficial to introduce the modern crop-models.
- There are a lot of research projects on particular issues; these projects should be combined into one regional multidisciplinary project that could study the system as a whole including climate, ecosystems, social issues etc.
- There is a lack of specialists, especially young ones;
- Databases are disembodied.

## Recommendations

An integrated assessment of climate change impact in the socio-economical sectors, nature resources and ecosystems should be led. To conduct such as assessment, the following actions should be led.

1. Regional climate scenarios should be revised in accordance with new GCM data provided by IPCC and extended and detailed both on spatial and time scales. For this purpose different approaches could be used including statistical downscaling and regional climate modelling.
2. Impact models should be either developed or existing ones adapted to regional specific features. Socio-economical scenarios could be used as inputs of the models.
3. Studies of climate change impacts on the desertification and land degradation should be led.
4. Regional climate databases should be improved.
5. A regional climate information system including GIS and web-portal should be created.
6. Training for different groups of scientists (climatologists, hydrologists, social scientists, environment scientists, etc.) should be led.

## **SESSION 2 - LAND USE, REGIONAL ECOSYSTEMS AND BIODIVERSITY**

### **Importance of the theme**

- The richness of ecosystem types over the Central Asian Region should be duly acknowledged.
- The long-term human occupation within the region cannot be ignored relative to past transformations and current land use.

### **State of the art to-day**

The current knowledge of land status is well known, though consistent reporting of the data needs additional effort.

The goal of the planned activity or projects should be:

- To develop an interdisciplinary framework for “Synthesis of Ecosystem, Land Use, and Biodiversity of main landscapes associated with mountains, deserts and grasslands, irrigated croplands, and dry sea-beds,
- To set up and implement an information transfer strategy for multidisciplinary communication and to inform decision makers and resource managers at various levels.

### **Gaps to be filled**

The perceived main gaps include:

- To set up an interdisciplinary network of scientists (social science to physical scientists),
- To develop connections with rural development groups,
- To unify data exchange and data collections (transparency, understandability and intercomparability),
- To set up a monitoring network,
- To develop a synthesis methodology.

### **Recommendations**

It is proposed to develop a regional interdisciplinary research network to provide an analysis of current land status of ecosystems (relative to land productivity and other ecosystem services) in mountains, deserts and grasslands, irrigated transformed lands, and dry seabed of desiccated water bodies.

The expected outcomes are:

- Current status of ecosystem of the Central Asia,
- Further the understanding of factors leading to land degradation,
- Strategies for sustainable land use,
- Communications strategies that link scientists and decision makers more effectively.

## SESSION 3 : AIR POLLUTION & ATMOSPHERIC COMPOSITION CHANGE

### Importance of the theme

Being one of pollutant transporters atmosphere predetermines ecology situation in the region. Air quality directly effects on population health. Atmospheric composition change is of reasons for Global Change and its regional composition is not only a regional concern. Aerosol transport is directly correlated with desertification. Atmospheric transport of sand and salt (including sand motion caused by wind) can spoil soil quality and is important for the region and its habitants. At the same time it changes regional radiation balance through atmosphere optical properties.

It should be mentioned that both anthropogenic and natural pollutions are mixed together in the regional atmosphere, which might produce unpredictable consequences due to synergism.

### State of the art to-day

The number of operations in the region and the associated cities air quality posts is diminishing. Control of industrial and transport input into pollution of atmosphere is weak. Lack of reliable data on air composition in the Aral Sea area (especially at its dry sea bed) makes the overall situation unknown. It should be added that greenhouse gases concentrations are measured at the Issyk Kul station only. There is no contemporary IT supports for regional environmental data accumulation and exchange.

At the same time remote sensing data are successfully used in dust storms modelling efforts.

**The needs in refined scientific results** arises from:

- Known correlation linking chemical composition and air quality to population health and food quality (via agriculture chain);
- Observed diminution of the ozone layer above the region and increasing UV radiation level in mountain regions;
- Observed influence of dust storms on agriculture and population health, and
- Necessity of regional environment monitoring, especially for former Aral Sea bottom and mountain glaciers.

**The needs in multidisciplinary cooperation** arises from:

Specificities of regional environmental problems, in which Atmospheric Physics and Chemistry, Information Technologies, Environmental and Social Sciences phenomena should be understood and addressed. The following linked phenomena only open a list of those: Atmospheric composition and environment state; Atmospheric composition, Agriculture, Land use, Water resources and population health; Air quality and desertification; Air composition/quality and Global Change.

### Gaps to be filled

The needs in refined scientific results and in multidisciplinary cooperation arise from the state of the art as described above, which suggests how to go further by analysing and understanding the chains and processes underlying the observed phenomena.

Among others, this implies to have a sufficient number of relevant of monitoring stations and operations. These elements must be brought together into a standardized comprehensive regional environment monitoring network.

It also implies to take into account existing skills within a comprehensive and standardized approach, to integrated regional study (IRS as defined by IGBP) of Central Asia, which enters as a part to planned IRS on Northern Eurasia.

The collected results and the outcomes of past, ongoing and future research have to be friendly accessible via Internet through a regional environment information infrastructure as an open regional environment information resource.

Educational and training activities have to be developed.

## Recommendations

Major instruments to be used here are thematic regional networks and cooperative RTD projects involving national research groups and their abroad partners and funded mainly by relevant International Agencies and Programs, like UN, START, INTAS, APN, EC FP6, etc. While composing Consortiums to lead such projects, the scientific skill of Russian research organizations that worked earlier in cooperation with regional actors in area of regional environment should be taken into account. These projects should be arranged as steps to integrated regional study of Central Asia which enters as a part to planned IRS on Northern Eurasia, as quoted above.

The first set of such projects should include:

- Development of regional environment information infrastructure via Internet as an open regional environment information resource (here results of INTAS project ATMOS and the MEDIAS network expertise should be taken into account);
- Development of comprehensive regional environment monitoring network for air quality/composition observations (special attention to the former Aral Sea bed should be paid);
- Study of chain: Agriculture, soil degradation and interrelations with air quality, greenhouse gases production, ozone depletion and carbon cycle;
- Study of chain: Polluted atmosphere, agriculture, crops and food quality;
- Detailed instrumental observations via local measurements and satellite remote sensing of Aral Sea basin and relevant modelling aimed at determination of its landscape dynamics and its properties as a source of salt and sand. It should lead to prognoses of its dynamics and understanding its influence on regional environment, population health and economic stability.
- Also one Demonstration Project is recommended for implementation: Development of Demonstrator of mitigation of negative consequences of the Aral Sea degradation and reversing them to tomorrow positives by means of development of cultured productive artificial landscapes. Such approach should be also considered as a way to diminish salt-sand storms in the region.
- It should be added that the listed above activity should be supported with relevant Networking and educational/training activities.

## **SESSION IV : WATER RESOURCES, QUALITY AND QUANTITY**

### **Importance of the theme**

Sustainable development of the country demands rational use of limited fresh water resources. However, it cannot be used rationally if amount and location of freshwater resources are unknown, as well as their possible unsteadiness in the near future.

Decision making on use of water resources is a challenging process and there is essential need for integrated multidisciplinary approach. Food manufacturing, industry, domestic needs, and production of hydro-energy and protection of ecosystems generate demand for water. And this demand is constantly increasing to satisfy the necessities of growing population and raising living standards. In its turn water industry and other key industries of the economy making high demands of hydrological science, especially, hydrological forecast.

When speaking about present and future state of water resources of the region, importance of objective and realistic evaluation of water resources of the Aral Sea basin should be kept in mind.

### **State of the art to-day**

Water resources issues are a touchy problem. It should be acknowledged that they are a matter of national sovereignty, since in countries of Central Asia monitoring and managing water resources is an essential tool for economic planning and development. On that respect, each country has developed, or has inherited from the USSR period, monitoring tools and is developing proper modelling according to national needs, policies and priorities. Due to economic reasons and priorities, national networks of monitoring stations are facing poor maintenance, upgrading and development. As stated above, models to forecast resources and define their optimal use have been defined on a national basis. Nevertheless, it should be acknowledged that such an approach should be complemented by a regional approach, since both water forecast and global water consumption has transboundary, regional aspects and teleconnections to more global aspects such as global change. Such a concerted scientific regional approach does not exist so far.

### **Gaps to be filled**

From a general point of view, as underlined above, national approaches should be complemented, made homogeneous as needs arise, and synthesised into by a regional approach, taking into account the fact that both water forecast and global water consumption has transboundary, regional aspects and teleconnections to more global aspects such as global change.

Solving the problems of water resources evaluation is connected with the availability and accessibility of information, its scaling and integrating data obtained from different sources into unified database. Thus it is necessary to pay essential attention to hydro meteorological monitoring, which is the system of tracking hydrological regime components. It includes monitoring the regime of water bodies, data processing, statistical and physical analyses, integration and assessment of information, as well as delivering forecast information and recommendation on data use.

Reduction of measuring stations, especially on mountain regions, severely cut down the possibility of obtaining qualitative information. Despite the administrative state boundaries it is very vital to monitor mountain glaciations and snow covers in zones where water flow forms. As a consequence, it is quite necessary to turn back the declining process of diminishing observation systems of the countries and at this point it is important to attract attentions of donors and international organisations.

Today we should take into account the fact that global warming will further contribute to increase the cases of extreme weather conditions, i.e. drought periods, high summer temperatures and changing the regime of water formation that may eventually cause additional negative impacts in Aral Sea basin.



Therefore, it is essential to develop and improve the regional hydrological monitoring system. Module *combination* of climatic, environmental, demographical, economy and other processes, which should have reliable information basis, serves as the vital instrument for the assessment of state of water resources in the region.

## **Recommendations**

A proper research plan has to be defined and implemented, bringing together local, national and regional aspects into a coherent and concerted approach. Such a plan should include the following aspects.

1. Enhancement system of environmental monitoring;
  - Enhancement system of monitoring of snow-ice resources of the region;
  - Development of unified monitoring programme of trans-boundary water quality in the Aral sea basin;
  - Monitoring of desertification and drought.
2. Establishment of Regional database on water resources of Aral Sea basin designed for forecasting water flow.
3. Study the trends that resulting in hydrological droughts in the region and establishing early warning systems for rational use of water resources.
4. Development of regional models of climate change and assessment of global change impacts on state of water resources in Aral Sea basin.
5. Methodology on water quality management on basin level.
6. Development and utilisation of new technologies in irrigated agriculture.
7. Publish popular literatures for NGOs and public on problems of water use and ways to solve the problems.

## OVERALL CONCLUSIONS AND RECOMMENDATIONS

### Taking advantage of the workshop and previous work.

A huge amount of previous work has been undertaken so far. First of all, research and monitoring stations have been developed and implemented during the USSR times. The theoretical and practical outcomes of these works and investments have to be taken into due account, maintained and upgraded, integrated into modern networks of knowledge, information and regional monitoring systems.

The same applies to all research and system implementation work that has been developed on a national basis after the collapse of the USSR. Now, a regional way of thinking has to be merged with work linked to national priorities and concerns and, whenever possible, interact with them in terms of standardized and co-ordinated programmes, normalized monitoring tools and datasets, friendly access to public regional information.

The results of programmes led in bilateral or multilateral co-operation have to be taken into due consideration and feed the forthcoming regional research programmes. For instance, the results and conclusions of the INTAS regional programmes have to be drawn up and taken into account in any forthcoming research programme. Former scientific links with Russia have to be nurtured.

The work of the nucleus regional network has also to be taken into account. In particular, this small network is at the origin of the present workshop, due to the pioneering efforts of Dr. Svetlana Nikulina. The network also had a preliminary contact with the LUCC International Project office, which made quite precious suggestions and recommendations to develop it and have it endorsed at an international level. It was suggested to have an overarching scheme to organize the regional studies, putting water issues at the heart of a flowchart taking into account the major physical and socio-economic regional issues in an overarching conceptual way. This overarching flowchart (presented by Dr. Gérard Begni during the opening ceremony) can of course be used to derive more specific flowcharts related to any disciplinary issue.

The workshop has been instrumental in identifying the state of the art, the gaps to be filled, and recommendations to go ahead in the main relevant disciplines. So, it also allowed drawing preliminary conclusions and recommendations at regional and interdisciplinary levels, an approach poorly addressed so far by global change and environmental local scientists. Efforts and initiatives to implement the recommendations issued by the workshop have to be implemented **now** in order to go forward in that way.

### A synthesis of main gaps to be filled

A specific attention has to be paid to the gaps identified in the four thematic sessions above. This paragraph is an attempt to draw up common features and an interdisciplinary synthesis

In any discipline considered, it is obvious that the **regional scale** is poorly addressed, to say the least. The same applies to monitoring systems and access to public information systems through open Internet interface. Moving forward into that direction implies first a political awareness at regional level (which requires some 'lobbying' and outreach activities from scientific national and organizations and donors), and a technical job to actually define and implement proper regional scientific programs. This requires in particular defining and implementing compatible and intercomparable measurements methods and the associated data exchange formats.

Reduction of measuring stations and monitoring systems in several key disciplines is indeed an actual and severe concern. Once again, a concerted regional approach can help defining an optimal way to maintain, upgrade and develop that system to the benefit of national and regional interests.

In particular, upscaling and downscaling techniques have to be developed in order to link the various scales to be taken into consideration, including teleconnections.

## A synthesis of disciplinary and interdisciplinary recommendations

Beyond specific recommendations developed above, the following recommendations have to be made.

After the collapse of the USSR, no political and financial authority exists at the regional scale. This has some major implications when compared to other regions all around the world:

- The scientists have to decide by themselves to work together and set up relevant regional networks, which can be both disciplinary and interdisciplinary. Some examples of such networks have been quoted above. They should operate within an overarching regional environmental network. They have to be co-ordinated at the regional scale, not from outside.
- Attention must be paid to all the important actors, in particular NGO's, socio-economic stakeholders at all levels including rural development groups.
- They must have a visible support and endorsement from such international intergovernmental and scientific authorities as APN and START, and from some associations as INTAS.
- In particular, sponsoring and funding agencies should openly encourage regional cooperation and emphasise it in their guidelines.
- A way should be found to define an outreach policy in order to draw the attention of national managers and policy makers on the interest to work at the regional level and to take into account scientific findings that could result from such a regional approach. They have to be convinced that this is by far the best way to save investment funding and consolidate sustainable development perspectives.

Access to data and information is quite crucial in order to lead research at the regional scale. Several points have to be underlined:

- In many regions, the meteorological, climatic and environmental observing and monitoring systems are suffering from degradation in quality and quantity. Several international organizations (WMO, GTOS) are aware of that bad worldwide situation. Nevertheless, the specific situation that prevails in central Asia makes it a quite critical 'hotspot' in that domain. A part of the above recommended outreach effort should be devoted to that issue. In addition, these systems should be made complementary, compatible and networked at the regional level.
- Some information can have a strategic value at a national level, so the governments may want to keep it secret. This hindering factor exists in every region. Nevertheless, it must not be overstated. A lot of environmental information can be made available and serve national interests on the medium and long run. So, at least information publicly available at the scientific and administrative levels should be made easily accessible at the regional level.
- To implement the above recommendation, it would be quite wise to identify the relevant datasets, put them into standardized formats, reference them through metadatabases and make them accessible through an Internet portal.

Beyond such recommendations related to infrastructure and outreach to policy makers, some specific scientific skills have to be developed in order to lead the proper research work:

- Climatic upscaling and downscaling techniques have to be developed on a consensual regional basis and wisely used by all scientists that have needs in that domain,
- Attention should be drawn on impacts of climate change, which has an influence in many disciplines
- In order to make coherent projections, coherent regional scenarios have to be discussed, scientifically endorsed and used by researchers. Such scenarios should be derived from the IPCC scenarios applied to specific regional features. They should be used and presented in a transparent way, especially to policy makers.
- Relevant interdisciplinary techniques have to be developed in order to address coupled phenomena into Integrated Regional Studies (IRS) within the Northern Eurasia context.
- The coupled use of such tools as remote sensing and outputs of *in situ* observation and monitoring systems (see above) thanks to proper assimilation techniques has to be developed.

Education and training of young regional specialists is a quite mandatory step to implement a regional sustainability science.

## **ANNEX 1**

### **PROGRAMME OF THE LAST SESSION**

#### **“OVERALL DISCUSSION AND SUMMARIZING”**

##### **1 – Organize breakout groups.**

Each breakout group will be made of the speakers of each of the four sections, under the coordination of the chairperson.

The breakout group should prepare two to three pages presenting:

- The importance of the theme for environment restoration and sustainable development in Central Asia (very short statement),
- The state-of-art to-day,
- The needs for scientific results on the short and medium-term,
- As a consequence, the gaps to be filled,
- Recommendations about how to fill these gaps (research topics, organisation....)

##### **2 - Synthesis of breakout groups – Interdisciplinary vision.**

- Each breakout group will present his conclusions (10 min),
- Briefly address questions and recommendations about each theme,
- Address questions and recommendations about a multidisciplinary ‘systemic’ vision,
- What overarching interdisciplinary results on the short and medium term are needed?
- As a consequence, which gaps have to be filled in that perspective?
- Recommendations about how to fill these gaps (research topics, organisation....)

##### **3 – Forthcoming synthesis.**

Within one week, Gérard Begni will issue a synthetic report bringing together:

- The conclusions and recommendations of the four breakout groups (using the material delivered by the four chairpersons),
- The conclusions and recommendations of the interdisciplinary synthesis.

He will circulate it to the chairpersons and the organizers, who will send their comments in order to issue a final version.

##### **4 – Outreach.**

That version will be sent to organizers and sponsors, who should implement it on their websites and above all take it into account in their short and medium term programmes.



## ANNEX 3 - LIST OF PARTICIPANTS

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