

# PROJECT INFORMATION DOCUMENT (PID) CONCEPT STAGE

Report No.: PIDC18262

<b>Project Name</b>	Bangladesh Regional Weather and Climate Services Project (P150220)
<b>Region</b>	SOUTH ASIA
<b>Country</b>	South Asia
<b>Sector(s)</b>	Flood protection (50%), General public administration sector (50%)
<b>Theme(s)</b>	Natural disaster management (40%), Climate change (30%), Water resource management (30%)
<b>Lending Instrument</b>	Investment Project Financing
<b>Project ID</b>	P150220
<b>Borrower(s)</b>	Economic Relations Division, Ministry of Finance
<b>Implementing Agency</b>	Bangladesh Meteorology Department
<b>Environmental Category</b>	B-Partial Assessment
<b>Date PID Prepared/ Updated</b>	06-Feb-2015
<b>Date PID Approved/ Disclosed</b>	18-Feb-2015
<b>Estimated Date of Appraisal Completion</b>	15-Oct-2015
<b>Estimated Date of Board Approval</b>	28-Jan-2016
<b>Concept Review Decision</b>	Track II - The review did authorize the preparation to continue

## I. Introduction and Context

### Country Context

The South Asia Region (SAR) is highly prone to water related hazards such as floods, drought, tropical cyclones and thunderstorms that frequently cut across national borders. Some parts of the eight countries of this region - Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka - are hit every year by one or more disasters, taking a heavy toll of life and property and causing enormous suffering and distress to thousands of families. In the past 2 decades, over 50% of South Asians, i.e, more than 750 million people have been affected by at least one natural disaster. Between 1970 and 2010, floods and cyclones together constituted almost 79% of all recorded natural disaster events. The trans-boundary monsoon system influences key productive sectors in the entire region and small variations in the timing and quantity of rainfall can have profound consequences on water availability, agricultural productivity and food security. The social and economic costs of such hazards estimated at 2-6% of SAR's GDP, can jeopardize efforts to end extreme poverty and boost shared prosperity and reverse hard-won development gains.

The societal vulnerability to extreme weather events in South Asia is clearly illustrated in the case of Bangladesh, one of the poorest and most densely populated countries in the world. With a per capita GDP (2013) of about 830 USD, it is home to 5% of the world's poor. Bangladesh is considered one of the most disaster-prone and climate vulnerable countries in the world. Located at the delta of the Ganga-Brahmaputra-Meghna river systems, it is regularly exposed to extreme weather events such as tropical cyclones associated with storm surges, floods, severe thunderstorms and drought. These impose substantial costs on the national economy, disproportionately affecting the poor. Damages and losses associated with a single extreme event such as the 2007 cyclone Sidr, estimated at 1.7 billion USD and 2.6% of the GDP, indicate the staggering effects natural disasters can have on the country's economy. Repeated exposure to hydro-meteorological hazards such as cyclones and floods often pushes the poor, particularly rural poor, into chronic poverty.

In the past decade, Bangladesh has made steady economic gains with GDP growing at the rate of almost 6 percent each year. The percentage of people living below the poverty line declined from 58.6 percent in 2000 to 43.3 percent in 2010. There have also been impressive gains in a number of social indicators including improvements in literacy, life expectancy, and per capita food consumption. To maintain and build on these development gains, leverage ongoing governance and economic reforms, and meet its ambitious goal of becoming a middle-income country by 2021, strengthening preparedness to natural disasters and climate change adaptation is critical.

To aid these efforts, the government is making important investments in critical infrastructure and in preparedness and response, particularly with respect to tropical cyclones. Despite these investments, the country's hydro-meteorological information infrastructure over land, atmosphere and ocean, basic public weather services, forecasting, and multi-hazard end-to end early warning systems remain weak and need to be strengthened. Further, key climate dependent sectors such as water and agriculture, need tailored weather and climate data, products, information and services to improve planning and decision-making and to mitigate the adverse effects of climate variability and change. Provision of such "climate services" at present is limited and needs to be strengthened.

While strengthening hydro-meteorological services and associated institutions in Bangladesh is an essential first step, regional collaboration is crucial. First, climate and weather patterns such as tropical cyclones, monsoons and severe thunderstorms impacting Bangladesh are trans-boundary and best monitored, understood and predicted by taking a regional and global perspective. Second, there is a demand in Bangladesh for regional information on weather and climate (such as tropical cyclone forecasts over the Bay of Bengal or regional drought forecasts) and a demand from regional centers--for example, from the Regional Specialized Meteorology Center (RSMC) located at the Indian Meteorological Department (IMD)--for weather and climate information (such as for atmospheric observations over Bangladesh) to enable them to make improved forecasts of regional and sub-regional weather phenomenon (such as severe thunderstorms) that can benefit all affected countries. Regional collaboration can help facilitate this exchange. Third, there are economies of scale in regional collaboration. For instance, at present, Bangladesh does not have the capacity to forecast extreme events such as cyclones, thunderstorms and flash floods with sufficient lead time and accuracy, or the capacity for long term climate monitoring and prediction. Regional collaboration can allow Bangladesh to build on information products and forecasts already being produced by regional entities rather than investing in developing such capacity from the start. Regional collaboration can also facilitate knowledge exchange on the delivery of weather and

climate services (for agriculture, disaster risk management and water) and scale up ongoing regional pilot activities.

## **Sectoral and Institutional Context**

### **South Asia Regional Initiatives**

The Hyogo Framework for Action 2005-2015, which has been adopted by most South Asian countries, provides a global blueprint for disaster risk reduction and identifies the need to cooperate regionally and internationally. While there has been a small but encouraging shift in the willingness of the countries of South Asia to engage in discussion of regional integration generally, South Asia has to date struggled to find suitable arrangements for regional cooperation despite the multitude of common problems the region is facing and shared resources that require coordinating policies and programs. The need for effective regional cooperation is pronounced and is urgent to mitigate risks and strengthen disaster preparedness.

Recognizing the risks posed by regional and trans-boundary hydro-meteorological hazards, the South Asia Association for Regional Cooperation (SAARC) – South Asia’s official organization for facilitating regional cooperation –has reiterated the need to strengthen and intensify regional cooperation “to address the challenges posed by climate change and natural disasters.” At the most recent SAARC Heads of State Summit in Kathmandu (November, 2014), members agreed to establish a cross-border information sharing and regional cooperation mechanism to fight climate change and to minimize the risks of natural disasters. It was agreed to establish a SAARC Environment and Disaster Management Centre (SEDMC) to spearhead this regional effort. South Asian countries also collaborate through other fora, notably the South Asian Climate Outlook Forum, which is convened annually to generate the climate outlook for the summer monsoon season. These events also form part of the demonstration phase for a World Meteorological Organization (WMO) Regional Climate Centre (RCC) for South Asia, at the IMD, currently under undergoing the RCC pilot phase. However, to attain benefits from regional cooperation, national measures are critically important. Due to the limited human resource and technical capacity in most of the hydrometeorological agencies in South Asia, there are major gaps in the expertise required for the production and dissemination of timely weather forecasts and Multi-hazard Early Warning Systems (MHEWS). Hence a large majority of the populations in South Asia do not get the forecasts and early warnings in time. This is also the case in Bangladesh, which is considered exemplary and made amazing progress in last mile connectivity and community based response to natural hazards.

### **Bangladesh Country Context**

In Bangladesh, the Bangladesh Meteorology Department (BMD), under the Ministry of Defense (MoD) is the main provider of meteorological services. BMD is mandated to provide weather and climate related services to a wide range of user sectors such as water, aviation, agriculture, fisheries, infrastructure, transportation and disaster risk management. Services provided by BMD such as routine weather forecasts are directly provided to the general public. Other data and information in the form for instance, of rainfall data used for flood forecasting by the Bangladesh Water Development Board (BWDB) under the Ministry of Water Resources (MoWR), or severe weather warnings for thunderstorms or cyclones (disseminated by the Disaster Management Bureau) or high tide warnings for fishermen or seasonal weather forecasts for farmers are provided by BMD to user sectors who can then use this information to inform affected communities or generate more tailored information and secondary information products for meeting the needs of their own sectors. Strengthening the capacity of the supplier of weather and climate services, meeting the demands of

selected user sectors, and strengthening the linkages between these is at the crux of the proposed project. Here, BMD is the supplier of weather and meteorological data, information and services. BWDB and the Department of Agricultural Extension (DAE) –both important economic sectors in Bangladesh, are users of meteorological information to meet the demands of the public and their own sectoral communities.

At present, BMD issues only 24 hour general weather forecasts and does not have the required land, ocean or atmospheric observation network, hardware, software or human resource capacity for issuing accurate short term weather or longer range seasonal forecasts. The country's meteorological observation network managed by BMD is primarily manual. Even though BMD operates doppler radars (established through JICA support) it does not have a sufficiently dense rainfall monitoring network to calibrate the radars. The network density of upper air observation and ground monitoring stations, is not adequate as per WMO standards to address tropical microclimates. Monitoring of the ocean system and land/ocean interface is critical for BMD to assess cyclone strength and storm surges. However, at present, there is limited reliable bathymetric data for the 700 kilometer coastline including important habitats such as the Sunderbans, the largest single block of tidal halophytic mangrove forest in the world. BMD does not operate any buoys in the Bay of Bengal or operate any coastal stations for measuring storm surge and is interested in upgrading its marine meteorological observation network. Though BMD has access to numerical weather prediction models, it uses them only on an experimentation basis due to lack of high computing resources. Due to limited computer storage capacity, it is unable to store regional data for use in research for seasonal forecasting, needed for the agricultural sector. BMD also needs regional and local climate modelling tools for assessing long term changes in climate and assessing impacts on priority sectors. It also needs capacity in a wide range of areas including tropical meteorology, weather forecasting, cyclone forecasting, radar meteorology, numerical weather prediction, oceanographic meteorology, and many others.

Further, the hydrological network, managed by the Hydrology Division of the BWDB, remains primarily manual with manual data collection, transmission and storage with only limited real time hydrological and flood forecasting. This affects the quality, accuracy and frequency with which data is collected and transmitted, and constrains BWDB's capacity for real time flood forecasting and early warnings. Network capacity is mainly along the major rivers and relatively insufficient on smaller rivers, urban catchments, remote areas and trans-boundary rivers. Models used by BWDB for flood forecasting cover only three fourths of the country. The existing database and archiving system of the Hydrology division within BWDB also requires upgrading.

Agriculture is another key user of meteorological services. In Bangladesh, agriculture contributes to almost 18% to the country's GDP and provides employment to about 60% of the people. Being primarily rainfed, agricultural productivity of key crops such as rice, jute, tea, and wheat is highly dependent on rainfall and weather patterns. Rice is the staple food in the everyday diet of Bangladeshis and 2 or even 3 crops of rice are harvested each year. While rice is grown mainly for domestic consumption, jute and tea are the main export earners. In Bangladesh, there are approximately 30 key agro-ecological zones. However, at present, neither BMD nor the Department of Agricultural Extension (DAE) have a systematic way of combining meteorological information and forecasts with agriculture related information to produce tailored Agro-Meteorological bulletins, information and products for farmers in the different agro-ecological zones that can help farmers make appropriate operational decisions about planting, harvesting, irrigation, adjusting cropping patterns etc. at the farm level.

Strengthening the national capacity for weather and climate services in Bangladesh has important national and regional benefits. National benefits include strengthened BMD capacity to meet the country's own national service delivery mandates for weather, climate monitoring and early warning systems. It has benefits in a wide range of sectors such as infrastructure, civil aviation, beyond disaster risk management, agriculture and water resources management. Improved monitoring, collection and digitization of weather and climate data shared through existing mechanisms such as the WMO Global Telecommunications System (GTS) will also enable improved forecasting and prediction of regional and transboundary phenomenon (such as cyclones, drought, thunderstorms, floods etc) which at present is not fully possible. For instance, in the pre-monsoon season between March-May, severe thunderstorms develop that affect Bangladesh but also neighboring northeast India, Bhutan, and Nepal. Though not as visible as tropical cyclones, they result in damages to livelihoods and property worth millions of dollars in Bangladesh and across the sub-region. Improved monitoring of upper air parameters over Bangladesh and sharing this information with regional entities will enable improved forecasting of such severe weather phenomenon. Similarly, improved efforts to monitor sea level rise across the coast of Bangladesh can contribute to improved understanding of changes in sea level rise in the Bay of Bengal.

#### World Bank Regional Program to Strengthen Disaster Risk Management

The World Bank Group's strategy for supporting South Asian countries to build resilience to risks from water related disasters is embedded in the conceptual shift from management of water related disasters to management of risks. At the national level, the Bank has been supporting hydromet related activities as part of numerous water, disaster risk management and environment projects including the India Hydrology projects. The World Bank's Regional Program builds on these activities and follows a dual approach: (i) strengthening regional collaboration with respect to disaster risk management and climate resilience; and (ii) enhance national capacity for the same. A cross-border information sharing and regional cooperation mechanism can only function if the inputs from national systems are robust. These projects – most within national borders but with vital relevance for regional cooperation– are now in varying stages of development and implementation including:

#### Active Projects

The South Asia Regional Hydromet Program TA (P146222) seeks to strengthen disaster preparedness and climate resilience through cross-border/regional dialogue, and the capacity of participating countries and institutions to respond to water related hazards and climate risks at the national and regional levels, by supporting improvements in monitoring, weather and flood forecasting, community based early warning systems and delivery of climate services.

The Nepal Building Resilience to Climate Related Hazards project (P127508) currently under implementation, is supporting multi-hazard information and early warning systems, upgrading the existing hydrometeorological system and agricultural management information system, and enhancing capacity.

#### Pipeline Projects

The proposed Regional Weather and Climate Services Program will be implemented as a Series of

Projects (SOP) over a five to eight year period. The approach is to start from the bottom up and strengthen national capacity for weather and climate services which are required for sub-regional and regional level collaboration. Like Bangladesh, other countries in the region such as Nepal and Bhutan, have inadequate hydrometeorological information and forecasting systems and are unable to fully meet their national mandates for delivering weather and climate services, use data and forecasts available already in the public domain and regionally to forecast severe weather or in turn contribute national level data and information for better forecasting of regional weather and climate phenomenon. Such national level, bottom up capacity strengthening activities will support national development goals, and also help implement key Regional Agreements relating to environment, disaster and climate resilience reflected in the Kathmandu Declaration made at the 18 SAARC Summit, November, 2014.

The Nepal Building Resilience to Climate Related Hazards project, which supports similar objectives and investment activities, would be considered the first project in the series. The Bangladesh Regional Weather and Climate Services Project (P150220) would be the second while the proposed Bhutan Regional Disaster and Climate Resilience Project, which has been requested by the Royal Government of Bhutan, is expected to follow. Its amount/timing/scope is under discussion. Each project is being initiated based on country demand/request, when it is ready. The timing and dialogue in each country is at different stages. However, since they all have similar objectives and will contribute to national and regional capacity development for weather and climate related risks, hazards, services, it makes sense to have a common framework and sequence them as part of a series of projects. Each project will have a 5 year time frame for implementation. Overall regional program expected to take place over 5-8 years.

Collaboration with the India Meteorological Department (IMD), which is the WMO designated Regional Specialized Meteorological Center (RSMC) for SAR, is expected to be strengthened. At present, the main focus of consultations is at a sub-regional level. However other countries such as Afghanistan have also expressed interest in linking up with the regional hydromet and resilience program.

Rational for regional IDA: The Program meets all regional funding eligibility criteria: it includes more than three countries (Bangladesh, Nepal, and Bhutan), and more countries are expected to participate in future projects in the series; (ii) each project in the series is expected to generate significant benefits that spill over country boundaries. Isolated national interventions are insufficient to remedy critical regional gaps; (iii) there is clear evidence of regional commitment, most recently demonstrated at the SAARC Heads of State Summit in Kathmandu where members agreed to establish a cross-border information sharing and regional cooperation mechanism to fight climate change and to minimize the risks of natural disasters; and (iv) it provides a platform for harmonization through the to support the WMO's Regional Specialized Meteorology Center (RSMC) for South Asia Region.

### **Relationship to CAS**

The proposed project is fully consistent with the Bank's Country Assistance Strategy (CAS) 2011-2014 and key pillars of the Country Assistance Strategy Progress Report (CASPR) 2011-2015. Specifically, the project supports the CASPR pillar on Vulnerability, Adaptation and Inclusion and the revised outcome on "Enhanced Disaster and Climate Change Preparedness." By supporting improved weather and climate information services and strengthening disaster risk management systems, the project is directly supporting this outcome area. In supporting agricultural productivity

though the development of improved agricultural information management systems, it also supports CASPR outcome on Agriculture and Food Security. The project is fully aligned with and will help implement the South Asia Regional Integration Strategy (2014) that identifies improved hydromet modernization, disaster preparedness and climate resilience as a high priority area to support regional integration.

## **II. Proposed Development Objective(s)**

### **Proposed Development Objective(s) (From PCN)**

The main objective of the proposed project is to strengthen the capacity of the Government of Bangladesh to deliver weather and climate information in priority sectors and to prepare for climate variability and hydro-meteorological disasters.

### **Key Results (From PCN)**

The main results of the project will be measured through the following indicators.

1. Improved accuracy and lead time for weather forecasts and multi-hazard early warnings
2. Increased sharing of data and information for extreme regional events
3. Increase in number (%) of end users satisfied by hydrometeorological services
4. Increased farmer satisfaction with agro-meteorological services

## **III. Preliminary Description**

### **Concept Description**

The project interventions are expected to encompass improved meteorological information services, improved hydrological information services, strengthened forecasting and early warning systems, and improved dissemination of agro-meteorological information. It will be implemented over a period of 5 years.

The project has the following main components:

Component A. Strengthening Meteorological Information and Services (USD 40 million)

The main objective of this component is to strengthen lead time and accuracy of weather forecasting and Multi-hazard early warning systems. This component will be implemented by the BMD and include the following:

Sub-Component A1: Strengthening Meteorological Monitoring, Forecasting and Disaster Related Early Warning Systems (USD 28 million): This sub-component aims to support modernization of BMD's meteorological observation network over land, air and ocean, weather forecasting capacity and strengthening public weather and climate services. Modernization will be national in scope including critical habitats such as the Sunderbans. It will finance installation of new Automatic Weather Station networks, real time rain gauges with telemetry, upper air soundings and strength marine meteorology. The telecommunication system at BMD and its divisional offices, database management, will be upgraded. The sub-component will support access to high performance computers; state-of-the-art numerical weather prediction tools, and improved hardware and software for BMD and divisional offices. Modernization of BMD's information system will help it to improve its capacity for handling data from international and national observation networks, and observations from satellites and radar network. The weather forecasting system is expected to be upgraded from 24 hours to 7 days forecast with verification of reliability. This sub-component will

also support strengthening public weather services, development and implementation of a National Framework for Climate services, development of climate information products and services, support for urban weather services, and design of end-to-end early warning systems for severe weather phenomenon (such as thunderstorms) in targeted areas.

**Sub-Component A2: Institutional Capacity Strengthening, Project Management, Monitoring and Evaluation (USD 7 million):** This sub-component will provide strategic support for enhancing institutional capacity for weather and climate service delivery at the national and divisional levels. It will support strengthening policy and regulatory framework for BMD operations. The capacity strengthening of BMD will be improved through modern equipment, training and capacity building and collaboration with international meteorological institutions. This sub-component will also support successful project management, targeted analytic studies, and monitoring and evaluation.

**Sub-Component A3: Regional Collaboration: (USD 5 million)** This sub-component will support expanding GTS bandwidth to improve exchange of meteorological data to and from regional centers, scaling up ongoing regional pilot mechanisms such as Bangladesh's contribution and participation in the South Asia Climate Outlook Forum (SASCOF), support to scaling up SAARC-Severe Thunderstorm Observation and Regional Modelling (STORM) program; participation by BMD officials in regional workshops; twinning arrangements with regional and international hydrometeorological agencies; regional technical studies; establishment of climate portal for accessing and sharing regional weather and climate information products; and regional consultations and workshops to support disaster resilience.

**Component B: Strengthening Water and Flood Information Services (USD 27 million)**

The main objective of this component is to improve lead time and accuracy of hydrological forecasting, risk information and strengthen early warning systems. The component would be implemented by the BWDB and includes the following:

**Sub-Component B1: Strengthening Hydrological Monitoring, Forecasting (USD 15 million):** This sub-component will support design and modernization of the country's hydrological observation network and forecasting, including installation of automated hydrological stations, strengthening groundwater monitoring network, sediment monitoring and measurement of river morphology. BWDB's existing equipment repair and calibration facility will be upgraded and a centralized Data Center will be established. Multipurpose communication technologies for transmission and processing data to enable higher quality forecast and increase flood warning lead times. This sub-component will also support acquisition of hardware and software for improving hydrological and flood (flash floods, urban, riverine, coastal floods) forecasting. This would include a flood prediction model capable of assimilating river flow routing information and generating inundation maps. The model would be developed, calibrated and validated for basins/ivers in Bangladesh.

**Sub-Component B2: Early Warning Systems and Disaster Risk Management in Priority Areas (USD 7 million):** The objective of this sub-component is to improve Early Warning Systems (EWS) and Disaster Risk Management in priority areas. Building on existing risk assessments, this sub-component will support development of end-to end flood related early warning systems, including identification of risk through multi-hazard risk assessments leading to generation of credible risk information for informing mitigation actions at policy, planning and community levels; establish decision support tools for flood risk management including software, hardware; installation of a



now-casting system for flash floods and strengthen community based early warning systems. This sub-component will be implemented in close coordination with sub-component B1. While forecasting and procurement of systems and equipment related to forecasting would be covered under sub-component B1, this has an intrinsic relationship with dissemination of early warnings as a critical input. Priority areas/districts will be identified during preparation.

**Sub-Component B3: Institutional Capacity Strengthening, Project Management, Monitoring and Evaluation ( USD 5 million):** This sub-component would support institutional strengthening of the Hydrology Division of the BWDB. This would focus on strengthening the capacity of central, divisional and sectional offices of BWDB; establishment of a knowledge center that would serve as a repository of all water and flood forecasting related data and information, technical studies and project management. This sub-component will also support M&E activities to track implementation progress.

#### Component C: Agro-Met Information Systems Development and Use (USD 8 million)

The main objective of this component is to provide appropriate agro-meteorological services to farmers in priority districts. The main implementing agency for this component will be the DAE and has the following sub-components:

**Sub-component C1: Development of a Decision Support System for Agro-Meteorological Information (USD 4 million):** This sub-component will support the development and operationalization of a Decision Support System for processing agro-meteorological information. Activities to be funded include setting up a web-based portal for agromet services; support for hardware and software; development of agricultural monitoring products; risk mapping of climate vulnerable communities; and development of agricultural information products.

**Sub-component C2: Dissemination of Agrometeorological products to farming communities in different agro-ecological zones (USD 2 million):** This sub-component would support outreach and dissemination of agrometeorological information services to farmers in priority districts; and development of mobile applications and use of new technologies. The sub-component will also support capacity building and training at the farm level for improved use of weather and climate information.

**Sub-component C3: Institutional Capacity Strengthening, Project Management, Monitoring and Evaluation (USD 2 million):** This sub-component would support technical capacity strengthening of DAE staff, technical studies, participation in regional fora on agromet service delivery, training visits, project management and monitoring and evaluation. The use and impact of disseminated information would be monitored and assessed at the community level through this sub-component.

#### Component D: Contingent Emergency Response Component (USD 0)

Following an adverse natural or man-made event or that causes a major disaster, the Government may request the Bank to re-allocate project funds to this component (which presently carries a zero allocation) to support response and reconstruction. This component would allow the Government to request the Bank to reallocate project funds and designate them as IRM funds to be engaged to partially cover emergency response and recovery costs. This component could also be used to channel additional funds should they become available as a result of the emergency.

**IV. Safeguard Policies that might apply**

<b>Safeguard Policies Triggered by the Project</b>	<b>Yes</b>	<b>No</b>	<b>TBD</b>
Environmental Assessment OP/BP 4.01	x		
Natural Habitats OP/BP 4.04			x
Forests OP/BP 4.36		x	
Pest Management OP 4.09		x	
Physical Cultural Resources OP/BP 4.11			x
Indigenous Peoples OP/BP 4.10	x		
Involuntary Resettlement OP/BP 4.12	x		
Safety of Dams OP/BP 4.37		x	
Projects on International Waterways OP/BP 7.50			x
Projects in Disputed Areas OP/BP 7.60		x	

**V. Financing (in USD Million)**

Total Project Cost:	75.00	Total Bank Financing:	75.00
Financing Gap:	0.00		
<b>Financing Source</b>			<b>Amount</b>
BORROWER/RECIPIENT			0.00
International Development Association (IDA)			75.00
Total			75.00

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