

Kingdom of Cambodia
Ministry of Land Management, Urban Planning and Construction (MLMUPC)
General Department of Cadastre and Geography (GDCG)

The Preparatory Survey Report
on
the Project for the Establishment
of
Nationwide Continuously Operating Reference
Station Network
in the Kingdom of Cambodia

August 2023

Japan International Cooperation Agency (JICA)

Eight-Japan Engineering Consultants Inc.

PASCO Corporation

Infrastructure Development Institute -Japan

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JR
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USD 1.00 = JPY 139.27

TTS Average Rate from 1st July 2022 to 30th September 2022

Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Eight-Japan Engineering Consultants Inc. consist of Pasco Corporation and Infrastructure Development Institute-Japan. The survey team held a series of discussions with the officials concerned of the Government of Cambodia and conducted a field investigation. As a result of further studies in Japan, the present report was finalized. I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Cambodia for their close cooperation extended to the survey team.

August 2023

Hiroo Tanaka
Director General,
Infrastructure Management Department
Japan International Cooperation Agency

Summary

1. Outline of the Kingdom of Cambodia

The Kingdom of Cambodia (hereinafter referred to as "Cambodia") is located on the Indochina Peninsula and bordered by Thailand to the northwest, Laos to the north, and Vietnam to the southeast. The land area is 181,035 square kilometers (about half the land area of Japan), which is about 440 km from 8°30' to 14°40' north latitude and from 102°40' to 107°37' east longitude (about 560 km).

Cambodia has a tropical monsoon climate. The climate can be divided into two main seasons: the rainy season and the dry season. The rainy season is from May to October, and the dry season is from November to April. Temperatures are lowest in December and January and highest in March and April, when the maximum temperature can reach 40°C (104°F). The average annual precipitation is 1,400 mm in the central plains and 3,800 mm along the mountains and coast.

Cambodia recorded high economic growth of over 10% for four years from 2004 to 2007. However, due to the global recession triggered by the subprime mortgage crisis, the economic growth rate dropped to 0.1% in 2009. By 2010, it recovered to 6.1%, and from 2011 until 2019, the economy continued to grow at a steady rate of about 7% per year due to solid exports of garments and other goods, and steady increases in construction, services, and foreign direct investment.

In 2020, the new coronavirus infection (COVID-19) pandemic, resulting in negative growth, but the growth rate is predicted to be 3% in 2021 and 5.1% in 2022.

2. Background, History and Outline of the Project

In Cambodia, based on the Fourth Quadrilateral Strategy (2018-2023), which outlines responses to medium-term policy issues, Cambodia needs to strengthen administrative services related to land registration and land transactions to promote development projects in the country. For this, the development of Continuously Operating Reference Station (hereinafter "CORS") that will enable rapid surveying and highly accurate positioning, as well as the development of equipment for data centers to manage these services in an integrated manner, are positioned as high priority projects.

However, the number of cadastral survey results averaged 600,000 per year in 2018, whereas in 2020, the number stagnated at 550,000 per year, the introduction of RTK-GNSS survey and the promotion of cadastral survey through the development of CORS network are strongly expected.

Based on this, the Government of Cambodia has requested technical assistance to speed up cadastral survey and strengthen its ability to provide highly accurate location-based services, and the "Project on Establishment of continuously Operating Reference Stations (CORS) for Land management and Infrastructure development" (hereinafter referred to as the "Precedence Technical Project") has been implemented since August 2021 for the General Department of

Cadastral and Geography (hereinafter “GDCG”) of Cambodia. The purpose of the Precedence Technical Project is to (1) develop five CORS and a data center, (2) strengthen the operational capacity of the Cadastral Geospatial Information Authority for CORS and data center, and (3) promote the use of CORS data by government and private organizations.

Based on the results of the survey, the project is planned to establish 94 new CORS, develop data center to manage and analyze the surveyed data, distribute the data to CORS users, provide soft components (technical assistance) for the maintenance and management of CORS, and provision of equipment.

3. Summary of Survey Results and Project Description

JICA dispatched a survey team to conduct a field survey from September 17th to October 16th, 2022, in order to develop a plan for the development of CORS. The survey team held discussions with Cambodian government officials and conducted a field survey, and conducted a technical review of the Cambodian side's request, examined it from the perspective of its appropriateness as Japanese Grant Aid, and confirmed the need for CORS network and data center to manage surveyed data and other information.

After the survey team return to Japan, considering the knowledge of the Precedent Technical Project, the validity of structure of CORS was examined, and the specifications of the equipment to be provided was conducted through field surveys and interviews with relevant persons. Based on the results of these studies, the team conducted outline design of CORS, determined the specifications of the equipment to be provided, calculated the quantity of construction work, drew up a construction plan, and calculated the outline project cost.

The survey team concluded the results of the field survey and domestic analysis into a preparatory survey report (draft), and JICA dispatched the survey team to Cambodia from May 16th to May 26th, 2023, to obtain agreement on the contents from the concerned parties in Cambodia as given in **Table-1** and **Table-2**.

Table-1 Outline of CORS

Equipment	Quantity	Composition (Purpose of use)	Required specification
Pillar	94	Facility to place GNSS antenna on the top	<ul style="list-style-type: none"> • 5m height • Superstructure made by reinforced concrete. • Substructure is supported by precast piles.
GNSS antenna	97*	Antenna for receiving radio signals from global positioning satellites	<ul style="list-style-type: none"> • Choke ring type suitable for multipath reduction, noise reduction, and multi-frequency reception
GNSS receiver	97*	Equipment for receiving positioning information from global positioning satellites	<ul style="list-style-type: none"> • Positioning information from QZSS, GPS, GLONASS, Beidou and Galileo satellites can be received. • Received signals: QZSS (L1C/A, L1C, L2C, L5), GPS (L1C/A, L1C, L2C, L2P, L5), GLONASS (L1C/A,

			<p>L1P, L2C/A, L2P), BeiDou (B1I/C, B2a, B3), Galileo (E1, E5a, E5b, E5-AltBOC)</p> <ul style="list-style-type: none"> • Output Format: RINEX2x, RINEX3x, RTCM2x, RTCM3x, NMEA-0183 • Data format resolution: At least 10 mm (approximate distance), 0.2 mm (carrier phase)
VPS Mobile router	97*	Equipment that distributes received positioning information via a virtual private line (wired/wireless)	<ul style="list-style-type: none"> • Internet connection via VPN • SIM (4G/5G) card slot
Power Control Unit	94	Equipment that can remotely manage power to equipment	<ul style="list-style-type: none"> • Encrypted communications supporting IPsec protocol for data security in remote operations from a web browser
Uninterruptible Power Supply (UPS)	97*	Equipment that can provide temporary power supply in the event of a power outage	<ul style="list-style-type: none"> • At least 1.6kWatts / 2.0kVA output for stable operation of receiver and VPN/Mobile router • Output voltage 220V to 240V • 24 hours standby function

*3 sets out of 97 shall be provided to the Cambodia Government as stock

Table-2 Outline of Data Centre

Equipment	Quantity	Composition (Purpose of use)	Required specification
Server	2	A server on which the CORS management software is installed. The configuration will consist of two servers, with the first server as an active server and the second server as a standby server to provide redundancy.	<ul style="list-style-type: none"> • Rack Servers • 2 CPUs with 16-24 cores/32-48 threads or more • Hard drive: 600GB or more SAS • Windows Server 2022
L3 switch	1	Equipment to ensure independence of data center equipment and to connect to ministry LANs	<ul style="list-style-type: none"> • Layer 3, 24 x 10GbaseE ports • Rack type
Fire wall	1	Grant access to only a limited number of members of the ministry.	<ul style="list-style-type: none"> • Firewall throughput: 10 Gbps • Rack type
Storage server	1	The data storage will run as a database on the CORS management server and will be used for data storage.	<ul style="list-style-type: none"> • Hard Drives: 24 x 2.4TB SAS ISE 12Gbps in RAID6 • Rack type
Tape backup system	1	A device that stores data on magnetic tape. Back up CORS data on a regular basis and store it in a separate location to ensure data integrity.	<ul style="list-style-type: none"> • Supports LTO-8 or higher magnetic tape • 1 drive or more • Rack type

4. Project period

The construction period required for the implementation of this project was planned to be 9 months for the implementation design and 15 months for construction.

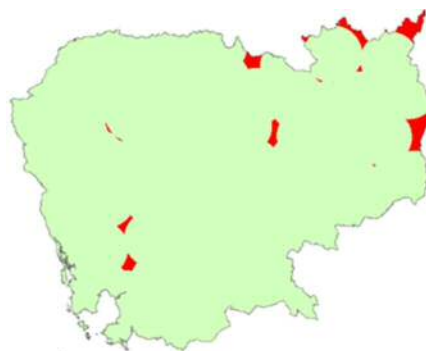
5. Evaluation

(1) Quantitative Evaluation

Table-3 shows the quantitative evaluation of the project.

Table-3 Quantitative evaluation of the project

Indicator	Baseline (2023)	Target (2028: 3 years after project completion)
Number of CORS established nationwide	5 locations	99 locations
Coverage area of single CORS in 40 km radius	5,024 km ² (Approx. 2.8% of the nation land)	177,867 km ² (Approx. 98.1% of the nation land)
Number of CORS user	338	1,200



(Green color represents the area to be covered)

Figure-2 Coverage area of CORS in 40km radius

(2) Qualitative Evaluation

The qualitative effects of the implementation of this project are as follows.

- i The introduction of CORS is expected to reduce time in cadastral surveying and increase the number of land transactions that can be handled. This will improve the administrative services.
- ii Network-based RTK-GNSS surveying (A method that enables a single surveyor to acquire position coordinates in a short time. This method can be put into practical use with the development of CORS network.) The introduction of new surveying methods, such as RTK-GNSS (network-based RTK-GNSS surveying), will speed up and improve the efficiency of surveying work in Cambodia.
- iii The efficiency of obtaining location coordinates will promote the digitization of the

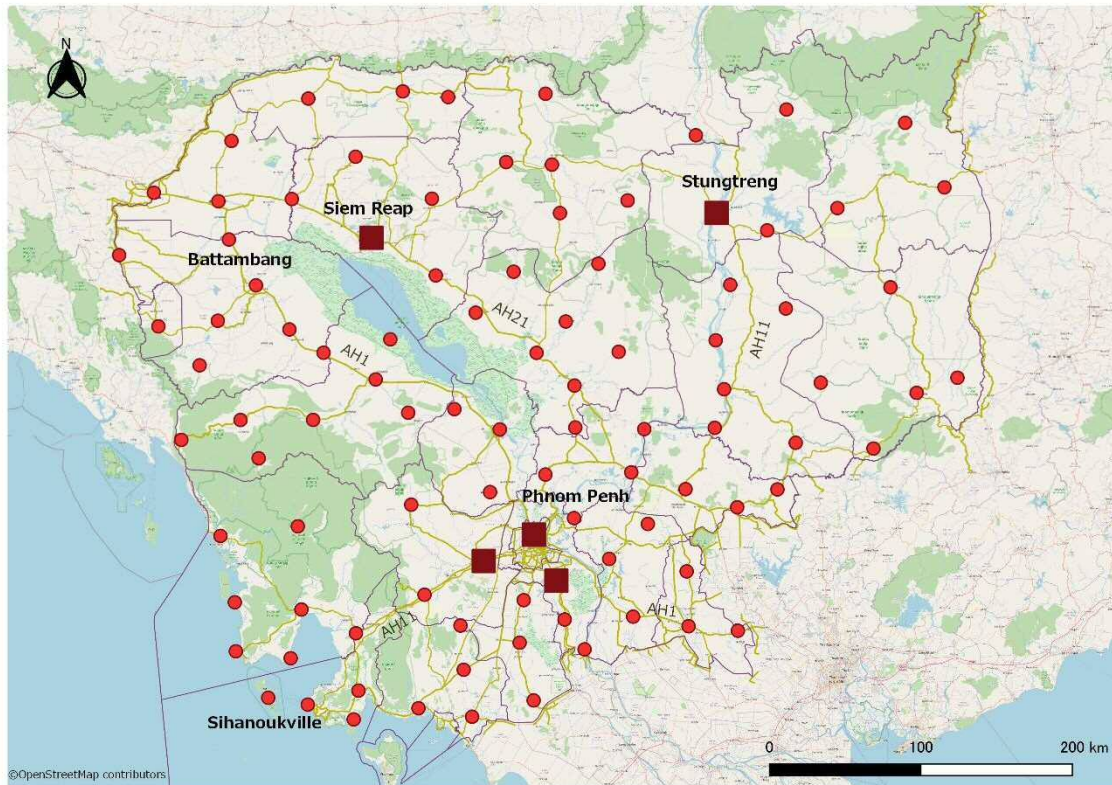
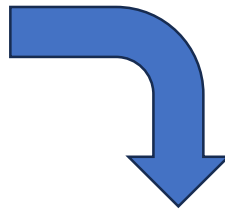
subsequent process of map creation and the development of geospatial information.





- iv The promotion of the digitization of surveying and geospatial information will lead to improved productivity and infrastructure development, such as roads, through the implementation of ICT construction at construction sites.
- v Enables efforts to provide location-based services using CORS, such as autonomous driving of agricultural machinery and drone deliveries to areas that are difficult to reach by land due to flooding and other reasons.

To summarize these quantitative and qualitative evaluations of effectiveness, the direct effect is that the number of CORS installed increased 20 times in three years, and the area to be covered by the effect increased 35 times, covering almost all of Cambodia, thereby reducing the time required for various surveys, including cadastral surveying, which leads to improved administrative services.

At the same time, the ripple effect is expected to promote the digitization of surveying and geospatial information in the country, accelerate the development of roads and other infrastructure, and build a foundation for providing location-based services such as autonomous driving, thereby contributing to industrial development in the country.

Location Map



Legend	
	①already in operation in the JICA technical cooperation project = 5
	②proposed CORS sites = 94
	province boundary
	principal road (AH = Asian Highway)

Bird-eye's view





Photo



Photo-1
Panoramic view of the CORS maintained by
the precession technical assistance



Photo-2
Brass Marker established near CORS



Photo-3
Existing stations in existing
coordinates scattered around CORS



Photo-4
Equipment of Data Centre such as
server and data storage



Photo-5
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Attachment-6: Evaluation sheet of CORS candidate sites

Attachment-7: Rainfall data

Abbreviation

AASHTO	American Association of State Highway and Transportation Officials
BS EN	British Standard European Norm
CORS	Continuously Operating Reference Station
COVID-19	Corona Virus Disease of 2019
CPU	Central Processing Unit
EN	European Norm
GDCG	General Department of Cadastre and Geography
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HIV/AIDS	human immunodeficiency virus/acquired immunodeficiency syndrome
ICT	Information and Communications Technology
IGS	International GNSS Service
ITRF	International Terrestrial Reference Frame
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
KVM	Kernel-based Virtual Machine
MLMUPC	Ministry of Land Management, Urban Planning and Construction
NMEA	National Marine Electronics Association
ODA	Official Development Assistance
QZSS	Quasi-Zenith Satellite System
RAID	Redundant Array of Inexpensive Disks
RC	Reinforced Concrete
RINEX	Receiver Independent Exchange Format
RTCM	Radio Technical Commission For Maritime Services
RTK	Real-time kinematic
UNOCHA	UN Office for the Coordination of Humanitarian Affairs
UPS	Uninterruptible Power Supply
VPN	Virtual Private Network

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1 Background and history of the Project

1.1 Current status and challenges in the sector

1.1.1 Current status and challenges

In Cambodia, the 2001 amendment to the Land Law established government responsibility for the protection of private land rights, and the Ministry of Land Management, Urban Planning and Construction ("MLMUPC") has started to conduct land boundary surveys (cadastral surveys) register ownership in the land registry and operate a land registration system throughout Cambodia.

In Cambodia, the surveying of cadastral surveying is still being done by the polygonal or GNSS method using stone reference points, which has led to a head-start in speeding up cadastral surveying. Cadastral surveying is a survey to measure the location and area of boundaries. Cadastral surveying is expected to clarify land rights, facilitate public works, disaster recovery, and equalize the burden of public taxes and dues. Therefore, stagnation in the implementation of cadastral surveying will have a significant impact on Cambodia's economic growth. On the other hand, Cambodia maintains one of the highest economic growth rates of over 5% among the member countries of the Association of Southeast Asian Nations (ASEAN), and demand for land for various development purposes, including social infrastructure development, securing land for industrial use, and tourism resources in the capital city of Phnom Penh and other urban areas, remains strong. Land registration forms the basis for clarification of ownership and land development, and delays in registration lead to problems over ownership, stagnation of real estate transactions and delays in new development projects, as well as loss of opportunities for the government to collect land transaction taxes. Therefore, the country is facing the challenge of further streamlining and expediting land surveying.

1.1.2 Development Plan

Cambodia's most important development strategy, the Fourth Quadrilateral Strategy (2018-2023), identifies "strengthening the management of urbanization" as a priority, and the efficient implementation of land surveying, topographic mapping, and civil works for development is a challenge.

With Cambodia's strong economic growth in recent years and the need for further infrastructure development, it is essential to modernize and accelerate surveying technology. To solve these issues, the introduction of GNSS surveying (especially network-based RTK surveying) using CORS* is an effective method to improve the efficiency of survey work. In addition, the installation of CORS will enable real-time positioning, which is expected to create businesses for digital transformation utilizing new high-precision positioning services in various fields, such as autonomous driving of agricultural machinery.

*Continuously Operating Reference Stations (CORS) are facilities that constantly receive radio waves emitted from positioning satellites that comprise the GNSS and accurately measure their own position on the earth. In Japan, the Geospatial Information Authority of Japan (GSI) has installed about 1,300 CORS in Japan, which are operated and managed as an integrated GNSS continuous observation system. In addition to serving as a standard for land surveying, GNSS is also used to analyze crustal deformation and provide basic data necessary for autonomous vehicle driving.

1.1.3 Social Economical

Cambodia's economy recorded high economic growth of over 10% for four years from 2004 to 2007, but the global recession triggered by the subprime loan problem affected the economic growth rate, which dropped to 0.1% in 2009. By 2010, the economy recovered to 6.1%, and from 2011 to 2019, the economy continued to grow at a stable rate of about 7% per year due to strong exports of garments and other goods, construction, services, and a steady increase in foreign direct investment. The economy is expected to secure 3% in 2021 and 5.1% in 2022, despite negative growth in 2020 due to the outbreak of the new coronavirus pandemic (COVID-19).¹

1.2 Background and Outline of Grant Aid Projects

1.2.1 Background and History of Grant Aid Projects

This project will strengthen administrative services for land registration and land transactions throughout Cambodia by developing CORS network that will enable rapid surveying and highly accurate positioning, as well as equipment for a data center to manage them in an integrated manner, thereby contributing to the promotion of development projects in the country and is positioned as a high priority project in line with the Fourth Quadrilateral Strategy (2018-2023). However, the number of cadastral surveys has stagnated at an average of 550,000 per year in 2020, compared to an average of 600,000 per year in 2018, and the introduction of RTK-GNSS surveying and the promotion of cadastral surveying through the development of CORS networks are strongly expected.

It is also expected to further boost Cambodia's economic growth as well as solve issues in the surveying sector, such as the creation of new businesses utilizing new high-precision positioning services in various fields.

Based on this, the Government of Cambodia requested technical assistance to speed up cadastral surveying and acquire the ability to provide highly accurate location information services, and the "Project on Establishment of continuously Operating Reference Stations (CORS) for Land management and Infrastructure development" (hereinafter referred to as

¹ IMF Website

"precedent technical project") has been implemented since August 2021 for the General Department of Cadastral and Geography (GDCG).

The precedent technical project aims to (1) develop five CORS and data centers, (2) strengthen the operational capacity of GDCG, and (3) promote the use of CORS data by government and private agencies.

This grant aid project aims to construct CORS network more widely throughout Cambodia, based on the results of the above-mentioned precedent technical project. In this preparatory study (hereinafter referred to as the "Study"), the necessity and appropriateness of the Project will be confirmed, an appropriate outline design as grant aid will be made, and formulation of project operation plan and cost estimation of the project will be conducted.

1.2.2 Outline of the grant aid project

In order to achieve the above goals, the project will plan and design facilities for 94 CORS, construct them, and transfer maintenance and management technology with software components. This will enable the establishment of a nationwide network of CORS and rapid cadastral surveying throughout the country. **Table 1.1** shows an overview of the grant aid project. The planned 94 reference points are located as shown in **Figure 1.1**, and their coordinate values are shown in **Table 2.6**.

Table 1.1 Outline of the Grant Aid Project

Items	Contents	Remarks
Construction of the facility/Establishment of equipment	CORS 94 points	Construction of RC pillar Installation of RTK-GNSS equipment
	Equipment for data center	Installation of CORS Software Installation of server and storage
Consulting Service	Detail design	Detail design of RC pillar
	Bidding support	Preparation of bid documents and assistance with bidding procedures
	Construction supervision	Supervision and quality assurance, progress monitoring in the construction
	Soft Component	Technology transfer for daily management of CORS and data management methodology

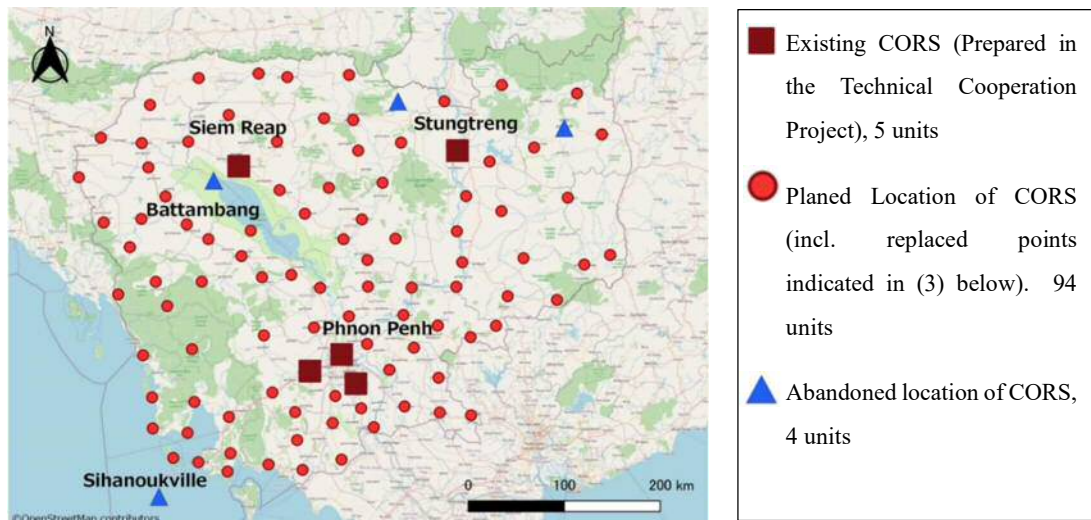


Figure 1.1 Location of CORS

1.3 Trends of Japan's Aid

Table 1.2 shows the main results of Japan's assistance to the Government of Cambodia in relation to surveying and mapping projects.

**Table 1.2 Major Achievements of Japan's Technical Cooperation
(Surveying and Mapping Projects)**

Method	year	Project Name	Outline
Development Study	1996-1998	Preparation of mapping information for emergency reconstruction	Prepare topographic maps (1/100,000), land use maps (1/100,000), and geological and topographic classification data (1/500,000) were prepared for 45% of Cambodia.
Development Study	1996-1998	Topographic mapping for Angkor archaeological area in Siem Reap Region of the Kingdom of Cambodia	Conducted reference point survey, aerial triangulation, digital mapping, digital editing and others in Siem Reap Province and the Angkor Archaeological Park area.
Development Study	2000-2002	Geographic Information Development Survey	Creation of a GIS geographic information database for all of Cambodia
Technical Cooperation	2021-2023	The project on Establishment of continuously Operating Reference Stations (CORS) for Land management and Infrastructure development	Provide technical assistance to develop and operate CORS, strengthen data center operations and maintenance capacity, and promote their use

1.4 Trends of other donors' assistance

A summary of assistance in the field of geospatial information provided by other donors is shown in Table 1.3.

Table 1.3 Assistance by other donor countries and aid organizations (in the field of geospatial information)

Year	Organization	Project name	Budget	Mode	Outline
2003-2004	KOICA	Cambodia's national geodetic control points installation project (Phase-1)	USD 1 Million	Grant	Set up 15 grade 1 control points, and 40 grade 2 control points in Kampong Chhnang province
2005-2006	KOICA	Cambodia's national geodetic control points installation project (Phase-2)	USD 1.2 Million	Grant	Set up 16 grade 1 control points, and 52 grade 2 control points in Pursat and Koh Kong
2007-2009	KOICA	Cambodia's national geodetic control points installation project (Phase-3)	USD 2.5 Million	Grant	Set up 7 grade 0 control points, 84 grade 1 control points, 60 control points, and 3 GPS CORS across Cambodia

2 Contents of the Project

2.1 Basic concept of the Project

The CORS to be developed are being installed in April 2022 through the " Project on Establishment of continuously Operating Reference Stations (CORS) for Land management and Infrastructure development " (August 2021 - December 2023 (tentative)), as indicated earlier, which involves the introduction of five CORS and the development of a data center in April 2022. With CORS in place, observers can efficiently conduct surveys in real time by combining information from positioning satellites acquired in the field and correction data generated from CORS observations in the surrounding area. (Refer to **Figure 2.1**). In this project, the design was carried out in accordance with the following policy, referring to the experience of precedent technical project and the Japan's GSI's case study.

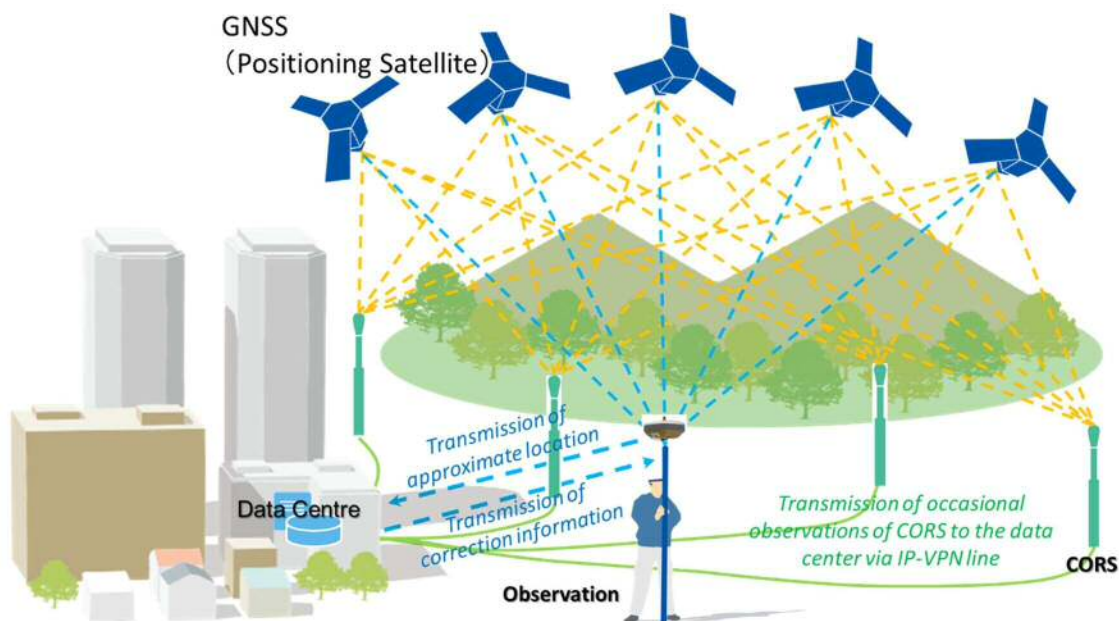


Figure 2.1 Overall diagram of CORS and data center

2.1.1 Structure of CORS

(1) Structure (Pillar)

An overview of the structure (pillar) concept is given below.

- Since the Cambodian government has designated the installation site to be on an official land such as a district office, the ground conditions are not necessarily conducive to support by a direct foundation. Therefore, based on the experience of precedent technical project, support by pile foundations will be used as the basic method of support.
- The pile foundation to be used shall be precast piles and shall be based on a structure of 4 piles driven into a footing 2.0 m (width) x 2.0 m (length) x 1.0 m (thickness).
- Height is based on 5 m above ground level.
- The structure shall be of RC construction and shall not allow any displacement of the structure due to its function of providing coordinate values from satellite information.

Table 2.1 shows the technical documents specifically applied in the design.

Table 2.1 Applied technical documents

Document	Publisher/year	
Standard Cost Estimating Standards for Design Work	Ministry of Land, Infrastructure, Transport and Tourism	2022
Kanto Regional Development Bureau Common Specifications for Civil Engineering Works	Kanto Regional Development Bureau	2022

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Kinki Regional Development Bureau Design Handbook, Volume 3, Roads	Kinki Regional Development Bureau	May 2012
Road Bridge Specifications I Common Edition November 2017	Japan Road Association	November 2017
Specifications for Highway Bridges IV Substructure	Japan Road Association	November 2019
Road Bridge Typhoon Design Handbook	Japan Road Association	December 2007
Technical Standard for Road Structures	Japan Road Association	May 2017
Road Earth Work -Retaining wall design standard	Japan Road Association	June 2012
Road Earth Work -Temporary structure construction guideline	Japan Road Association	March 1999
Pile foundation design guide	Japan Road Association	September 2019
2012 Standard Specifications for Concrete [Basic Principles]	Japan Society of Civil Engineers	March 2013
2017 Enacted Concrete Standard Specification [Design Edition].	Japan Society of Civil Engineers	March 2018

- The design of the top of the CORS structure should apply the one used in the technical cooperation project. The quotation including manufacturing and transport to the temporary yard of such concrete product shall be collected by GDCG to support the consultants.
- The fence around the foundation shall be considered to prevent from damaging or stealing equipment of CORS. The quotation of such product shall be collected and provided to the consultants by GDCG.
- The receiver, UPS, and other equipment should be installed indoors for security reasons. Cables shall be run from the GNSS antenna through the pillar and into the building through buried pipes.
- Although data transmission from CORS to the data center is based on optical communication cables, data communication lines will be secured in some rural areas where optical communication cables are not in place.
- Take measures against lightning.

(2) CORS equipment plan

Table 2.2 lists the equipment required in CORS and a summary of the equipment.

Table 2.2 CORS equipment plan

Equipment	No.	Component (Main Objective)	Location
GNSS Antenna	97*	Used to receive radio signals from positioning satellites and is installed at the top of the pillar's head.	Pillar head
Receiver	97*	Used to receive positioning information from satellites. In this project, it is assumed that the equipment will be installed in a building such as a district office for administrative reasons	Inside building
VPN/Mobile router	97*	This equipment distributes the received positioning information via a virtual leased line (wired/wireless). The dedicated line	Inside building

		ensures data security. Like the receiver, it is intended to be installed in a building.	
Power control unit	94	This equipment is capable of remotely controlling the power supply to the equipment. It is intended to be placed inside a building.	Inside building
Uninterruptible Power Supply	97*	This equipment is capable of temporarily supplying power in the event of a power failure, and will provide the power necessary to stably operate the antennas and receivers for a certain period of time. It is envisioned to be placed inside the building.	Inside building

* 3 sets out 97 shall be provided to the Cambodia Government as stock

2.1.2 Data center

- The data center will be located in the GDCG government building. A room used as a server room in the precedent technical project will be utilized.
- CORS management software is not limited to PIVOT (provide by Trimble) but the current quality and features of data management software of CORS under operation is desired to be continued. The detail of specification on the technical aspect such as accounting management feature, capable to process all type of satellite system will be discussed in the detail design stage.
- The bidding should be made under the strong competition and without having to specify the brand of the management software.
- In case of new system introduced, total training, installation, and calibration of the system to maintain the current level of quality and feature shall be necessary. The specification of above shall be discussed in the detailed design stage.
- Considering that the Cambodian side will expand the number of CORS in the future, the requirement for CORS management software is 200 points.
- The number of users to whom the correction data is distributed shall be 360 in view of the number of users using the system at the same time.
- Based on the experience of the precedent technical project, it is possible to reduce the interruption or duration of service provision by stocking a certain number of antennas and other parts that are prone to breakage. In this case, three GNSS antennas are stocked as spare parts.
- The warranty period is 2 years for maintenance of equipment such as CORS including GNSS antennas and other equipment for the data center.

2.2 Outline design of the Japanese Assistance

2.2.1 Deployment plan of CORS

(1) Concept of the deployment plan

Based on the request of the Government of Cambodia, the installation locations of CORS are

to be located on official lands such as district offices. Therefore, field surveys were conducted on 94 installation sites recommended by the Cambodian government, and their appropriateness was verified from the following perspectives. The ground shall be firm and an existing ground with flat terrain. However, the ground shall be within the range that can be determined visually, since ground investigations such as borings and geological investigations will be conducted at the time of detailed design.

- Electric power provided.
- A stable data communication line must be available.
- No obstructive structures over 15 degrees of the CORS elevation angle from the antenna for satellite acquisition
- Low risk of natural disasters (lightning, floods, landslides, high temperatures, storm surge, strong winds, etc.)

(2) Outline of the field survey

The summary of the field survey results is given as follows.

i. Radio reception status

a. Radio reception of the positioning satellite

Regarding positioning satellite signals, QZSS ("MICHIBIKI" Japan), GPS (USA), and GLONASS (Russia) were confirmed. There are no particular problems with reception of these satellites at any of the planned sites.

b. Radio reception of the tele-communication line

The data transmission of the positioning satellite data acquired by each CORS is mainly done by wired (optical fiber) IP communication, but it is also necessary to ensure wireless (4G cellular network) IP communication as a backup. However, we have confirmed that at least one of the four major telecommunications carriers can receive the signal. Therefore, it is judged that there is no particular problem.

ii. Commercial power supply status

There is no major problem in supplying electricity (commercial power supply) to CORS, since CORS is basically installed in public lands where offices exist. However, there are 27 locations where the length of power supply line exceeds 50m. Out of 27 locations, there are 10 locations where the line exceeds 100m. For these locations, it is necessary to install power sources so that they can be drawn within 50m, which will be borne by the recipient country's government.

iii. Administrator of the proposed installation site

The administrator of the proposed installation sites is mostly local outpost offices of MLMUPC's land registry department or district office-controlled lands. Some of the

sites include schools and other facilities. The use of these lands has to be officially agreed and approved by the Provisional Governor by writing. Therefore, the problems in future could be avoided.

There are 20 cases that do not fall under the regional office. Three of them are temples (Pagoda, Koh Kong Province 1 and Pho Sat Province 2). Including this temples, all of the lands are officially registered as public land, and to construct CORS in such place, as mentioned above, an official agreement and approval by the Provisional Government is required. Hence conflict in future could be avoided.

iv. Surrounding obstacles

Although low-rise buildings and trees are observed in the vicinity of the proposed installation site, most of the buildings are flat roofs, and the height to the roof is estimated to be around 5 m. Therefore, if the CORS antenna height of 5 m can be secured, it is determined that there will be no particular problem. Regarding the trees, it is unlikely that they will be a major obstacle. In addition, the company commented that they "plan to prune branches that have grown in a way that blocks radio reception.

In some cases, buildings and CORS are in close proximity to each other. This involves decisions, such as reviewing the height of CORS or changing its location. Therefore, measures shall be taken based on discussions with the Cambodian government at the detailed design stage, while confirming the site.

v. Existing disaster

Existing disaster that should be considered for this project are storms, flooding, and lightning strikes. Storms can cause pillars to topple and slide, and flooding and lightning strikes can cause CORS equipment to malfunction.

For storms, since they can occur anywhere in the country, a wind speed of 45 m/s was used as the design condition, in accordance with the findings of the UN Office for the Coordination of Humanitarian Affairs (UNOCHA).

Lightning strikes occur frequently, especially during the rainy season, but it is not necessary to install lightning rods at all planned locations, especially if there are buildings in the vicinity and they are within the protection range of existing lightning rods. If there are no buildings with lightning rods in the vicinity and a direct lightning strike is anticipated, the CORS should be equipped with lightning rods. In order to reduce the impact of lightning strikes on the components of CORS, the installation of lightning arresters is mandatory.

Since water is a major enemy of CORS, which incorporates precision electronic equipment, the effects of flooding must be avoided. The structure of the pillar should

be considered, such as thicker footings, in accordance with the history of previous floods. If the depth of water is unusually high, it is necessary to consider countermeasures, including modification of the structure, such as distributing receivers and other equipment on upper floors of the building, or fixing antennas on the roof of a robust structure.

(3) Unsuitable location

As a result of the field survey, the four locations listed below were determined to be unsuitable. In replacement, four alternative sites were selected in consultation with GDCG.

Table 2.3 4 sites deemed unsuitable and their replacement sites.

Site Num.	Province	Unsuitable reason	Replacement number	Province
BTB700KHM	Battambang	refused (Land use consent not obtained)	BTB800KHM	Battambang
PVR500KHM	Preah Vihear	refused (Land use consent not obtained)	MDK500KHM	Mondukkiri*
RNK100KHM	Ratanakiri	no data (Necessary data not obtained)	RNK400KHM	Ratanakiri
SHV500KHM	Sihanoukville	remote island (Isolated island with no regular traffic)	KRT300KHM	Kracheh**

*, ** For these two locations, the Cambodian government's intention was not to establish alternative points within the same province, but to increase the distribution of points in the eastern region of Cambodia.

(4) Supplemental investigation in the detailed design phase

Based on the results of the field survey of 94 points, the power supply and history of previous disasters, supplemental field surveys will be conducted at the detailed design stage for the following points, and the structure of CORS will be examined. As for the ground, a geotechnical investigation by boring will be conducted for all locations to verify the appropriate foundation structure, and changes will be made if necessary. The results of the survey of all 98 items (including 4 items deemed unsuitable) are attached in Appendix 5 at the end of this document.

The final candidate sites to establish CORS will be presented by the Cambodian government prior to detailed design, and would be confirmed by the consultants.

Table 2.4 CORS locations that need to be re-considered during the detailed design stage

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Number	Province	Outline
BTB200KHM	Battambang	There is an elementary school building approximately 5m high located 4m away from the CORS installation site, and the antenna needs to be installed at the same height as the building in order to secure the overhead visibility.
BTB400KHM	Battambang	Flood history of 3m depth
KRT600KHM	Kracheh	Cell phone company "Cellcard" tower (50m high) 150m away and medium voltage line poles (8m high) 15m away, possible source of strong electromagnetic radiation
PVG300KHM	Prey Veng	Antenna height needs to be adjusted due to proximity to the building
PST100KHM、	Pursat	Flood history of 0.8 to 2.5 m depth
PST200KHM	Pursat	Flood history of 0.8 to 2.5 m depth
PST500KHM	Pursat	Trees are obstructed and need to be pruned to avoid obstructions
PST700KHM	Pursat	The site is located on the shore of Tonle Sap Lake, and the local photo shows the entire surface of the water. Since the water depth is 8m and the nearest power source is 1km away, it is necessary to confirm the actual situation through a field survey and adjust the installation location according to the situation.
SRP300KHM	Siem Reap	Flood history of 5.0 m depth

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Table 2.5 Coordinates of targeted CORS

S/N	ID	X	Y	S/N	ID	X	Y	S/N	ID	X	Y
1	BMC100KHM	280,563	1,503,246	37	KKG200KHM	333,166	1,237,192	73	RNK200KHM	753,735	1,512,523
2	BMC200KHM	238,526	1,509,129	38	KKG300KHM	331,094	1,291,531	74	RNK300KHM	727,780	1,554,056
3	BMC300KHM	289,414	1,542,224	39	KKG400KHM	289,847	1,210,107	75	RNK400KHM	684,082	1,498,529
4	BTB100KHM	304,659	1,448,519	40	KKG500KHM	289,384	1,242,158	76	SRP100KHM	380,263	1,478,967
5	BTB200KHM	348,565	1,404,469	41	KKG600KHM	325,944	1,205,352	77	SRP200KHM	328,457	1,504,314
6	BTB300KHM	287,223	1,478,370	42	KRT100KHM	610,659	1,380,546	78	SRP300KHM	370,153	1,531,430
7	BTB400KHM	326,354	1,419,716	43	KRT200KHM	657,761	1,345,912	79	SRP400KHM	419,736	1,504,104
8	BTB500KHM	267,413	1,396,848	44	KRT300KHM	604,652	1,355,414	80	SRP500KHM	422,131	1,454,354
9	BTB600KHM	215,474	1,468,902	45	KRT400KHM	605,052	1,412,325	81	SHV100KHM	337,043	1,174,958
10	BTB700KHM	354,359	1,464,484	46	KRT500KHM	650,814	1,433,184	82	SHV200KHM	370,498	1,183,977
11	BTB800KHM	279,519	1,425,694	47	KRT600KHM	614,441	1,448,392	83	SHV300KHM	368,960	1,221,512
12	KCM100KHM	549,996	1,326,275	48	MDK100KHM	736,796	1,378,968	84	SHV400KHM	310,983	1,179,580
13	KCM200KHM	493,688	1,324,785	49	MDK200KHM	719,092	1,447,427	85	SHV500KHM	295,934	1,139,520
14	KCM300KHM	558,442	1,354,434	50	MDK300KHM	708,750	1,342,485	86	SHV600KHM	367,299	1,165,144
15	KCH100KHM	463,819	1,354,206	51	MDK400KHM	673,910	1,385,137	87	STG100KHM	605,241	1,494,919
16	KCH200KHM	457,380	1,313,405	52	MDK500KHM	763,414	1,389,021	88	STG200KHM	638,374	1,483,811
17	KCH300KHM	434,077	1,367,482	53	PNH100KHM	486,091	1,285,616	89	STG300KHM	650,482	1,562,100
18	KSP100KHM	453,157	1,268,472	54	PVR100KHM	497,973	1,526,013	90	SVR100KHM	587,850	1,225,944
19	KSP200KHM	414,178	1,246,537	55	PVR200KHM	503,207	1,494,662	91	SVR200KHM	620,310	1,223,111
20	KSP300KHM	405,599	1,305,338	56	PVR300KHM	468,155	1,527,669	92	SVR300KHM	586,511	1,261,771
21	KTM100KHM	487,913	1,403,987	57	PVR400KHM	493,815	1,571,838	93	TKE100KHM	476,695	1,215,076
22	KTM200KHM	507,027	1,424,342	58	PVR500KHM	543,976	1,544,983	94	TKE200KHM	479,422	1,242,864
23	KTM300KHM	528,333	1,461,829	59	PVR600KHM	591,616	1,545,174	95	TKE300KHM	485,911	1,177,305
24	KTM400KHM	541,628	1,404,700	60	PVR700KHM	547,295	1,502,845	96	TKE400KHM	437,779	1,226,322
25	KTM500KHM	513,290	1,355,476	61	PVR800KHM	547,295	1,502,845	97	OMC100KHM	339,578	1,569,228
26	KTM600KHM	512,703	1,382,732	62	PVG100KHM	535,590	1,269,812	98	OMC200KHM	401,050	1,573,533
27	KTM700KHM	448,147	1,430,121	63	PVG200KHM	560,938	1,292,679	99	OMC300KHM	430,518	1,569,769
28	KTM800KHM	472,975	1,456,671	64	PVG300KHM	551,361	1,232,123	100	PLN100KHM	240,658	1,422,374
29	KPT100KHM	409,987	1,172,310	65	PST100KHM	382,620	1,386,931	101	TKM100KHM	585,600	1,315,405
30	KPT200KHM	439,853	1,197,439	66	PST200KHM	403,795	1,365,223	102	TKM200KHM	645,914	1,315,463
31	KPT300KHM	445,342	1,166,659	67	PST300KHM	341,511	1,360,844	103	TKM300KHM	619,542	1,303,726
32	KDL100KHM	500,855	1,255,544	68	PST400KHM	293,948	1,361,054				
33	KDL200KHM	506,326	1,230,208	69	PST500KHM	255,008	1,348,406				
34	KDL300KHM	512,445	1,296,430	70	PST600KHM	305,642	1,336,026				
35	KDL400KHM	519,451	1,210,718	71	PST700KHM	392,278	1,412,966				
36	KKG100KHM	280,243	1,285,575	72	RNK100KHM	715,035	1,518,680				

Installed in the
precedent technical project

2.2.2 Outline design of CORS

An outline design was conducted based on the design conditions described in "2.1.1 Structures". In this study, the pile foundation structure is applied to 94 points as a standard structure in accordance with the knowledge obtained in the precedent technical project. As a result of the calculations, it was confirmed that the "no displacement" condition required for CORS was satisfied. The final structure will be modified as necessary based on the ground investigation at the detailed design stage.

(1) Design load

The combination of loads to be considered in the design should be set in consideration of the most unfavorable conditions among the combinations of loads that are likely to act simultaneously.

i. Dead Load

The unit volume weight of reinforced concrete and concrete to be used in the calculation of the dead load of the frame shall be the following values, which are generally adopted in public works projects.

Table 2.6 List of unit weight of materials

Material	Unit Weight	Material	Unit Weight
Metal	77.0 kN/m ³	unreinforced concrete	23.0 kN/ m ³
Reinforced Concrete	24.5 kN/ m ³	Cement Mortar	77.0 kN/ m ³
Precast Concrete	24.5 kN/ m ³	Sand, Gravel, Aggregate	18.6 kN/ m ³

ii. Seismic Load

Not taken into account since earthquakes are almost not observed in Cambodia.

iii. Wind Load

According to the "Strategic National Action Plan for Disaster Risk Reduction 2008-2013" formulated by the Cambodian government in 2008, Cambodia is protected by the surrounding mountains, so serious damage from typhoons is not frequent. In addition, the aforementioned UNOCHA tropical storms hazard map for Cambodia is based on a 5-point scale for wind speeds over a 100-year return period. Besides, Cambodia is classified as Category 1 (wind speed: 32-42.5 m/s), with only the southern end of the country having the lowest wind speed. For this reason, the wind speed of 45 m/s, which is also used in the precedent technical project, is adopted in this design.

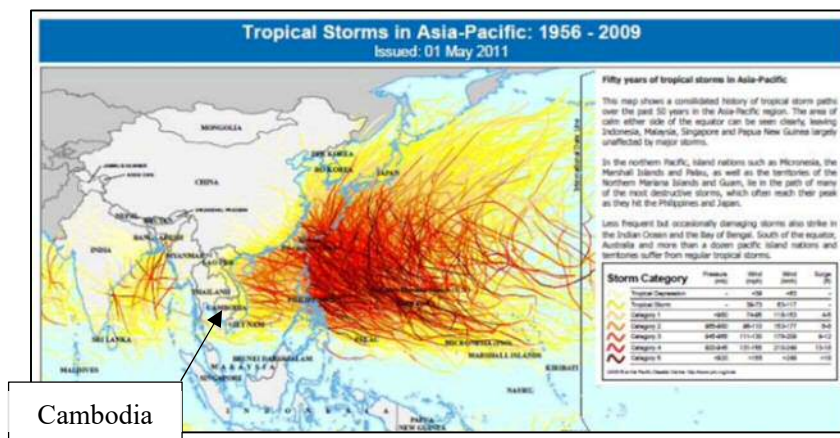


Figure 2.2 Tropical storms hazard map (UNOCHA)

(2) Sub-structure type

In selecting the type of foundation structure, it is generally necessary to comprehensively consider the topography, geology and soil conditions of the installation site, construction conditions, and the effects of surrounding structures and natural disasters, and to select an appropriate structure type. In this project, CORS is a ground-mounted type, and its own weight itself is not large compared to general civil engineering structures such as retaining walls. However, the required function of CORS requires that it resist various acting forces and prevent displacement.

In this design, since the installation site of CORS is designated as public land, the ground

conditions are not necessarily satisfying the requirement for the direct foundation support. Hence, the appropriate type of foundation must be determined based on the results of the ground investigation. In the precedent technical project, pile foundations were selected based on the results of geotechnical analysis, and based on this knowledge, it was decided to use pile foundations as the standard.

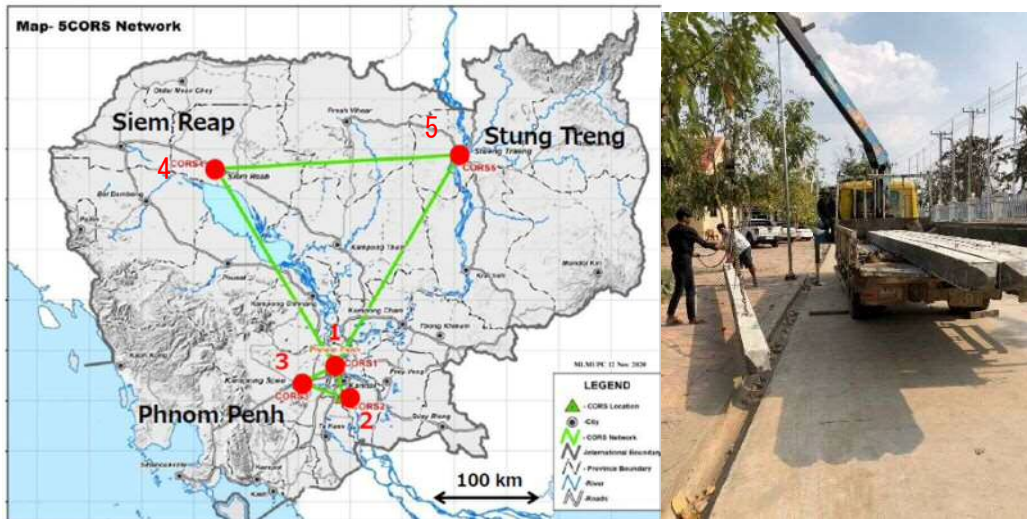


Figure 2.3 Installation location of CORS and delivery of precast piles in the precedent technical project

Table 2.7 Specification of piles in the precedent technical project

Location	Height of pillar	Length of pile	Pile type	Number of piles
MLMUPC	6 m	10.0 m	Precast	5
Sang	5 m	7.0 m	Precast	5
Samraong Tong	5 m	7.0 m	Precast	5
Siem Reap	5 m	9.0 m	Precast	5
Stung Treng	5 m	5.0 m	Precast	5

i. Depth of embedment of piles

The bearing capacity should be secured by penetration of the pile tip into the bearing layer. To ensure sufficient bearing capacity of the support layer, the standard penetration amount of the pile tip into the supporting layer should be the value shown in **Table 2.8** in accordance with the guidelines of the Japan Road Association.

Table 2.8 Penetration of the pile tip

Type of soil	Penetration length (δ)
Hard rock	0
Soft rock	0.3 m
Sand, Clay	$\delta \geq D$

If the support layer is sloped, the penetration is taken to be the smallest portion δ . (Refer to **Figure 2.4**)

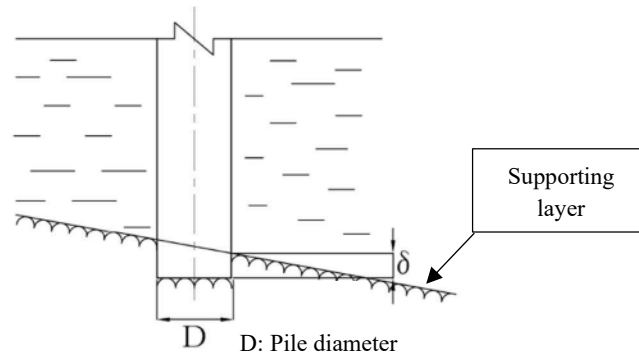


Figure 2.4 Penetration length of pile tip

ii. Soil testing and laboratory testing

A geotechnical investigation will be conducted during the detailed design phase to determine the ground conditions necessary for the design. Since pile lengths and diameters will vary depending on the ground conditions, and will also affect the placement of reinforcing bars in the footings, a reliable ground investigation is required.

In this design, RC precast piles of square 300, which were also used in the precedent technical project, will be adopted. Since this precast pile has a maximum length of 10 m, the depth of penetration test (boring) should be a maximum of 13 m, taking into account the pile head treatment, penetration at the pile tip, and confirmation of layer thickness.

If, as a result of the geological investigation, the support layer is deeper than 13 m, the installation location should be changed, or the pile should be designed as a friction pile, and other necessary changes should be considered. The guideline for the stratum to be used as the support layer is in accordance with the values adopted in the retaining wall design guidelines of the Japan Road Association (see **Table 2.9**).

Table 2.9 Guide of the support layer

Source	Super-structure	Guideline for a fair quality support base		Remarks
	Type of foundation	Clay	Sand	
Japan Road Association - Road earthwork- Retaining wall/Culvert Guideline	Retaining wall/Culvert	$N \geq 10 \sim 15$ ($q_u \geq 100 \sim 200$ kN/m ²)	$N \geq 20$	Even if the layer is considered to be a good support layer, if the thickness is thin or if there is a soft or compacted layer beneath it, it is necessary to consider its effect.

(3) Results of structural analysis

Since the overall structure of CORS is of the same material with reinforced concrete and no displacement is observed in the applied load, the analysis is performed as a cantilever beam fixed to the footing. The main design conditions are shown below.

- Concrete strength of the frame: 24 N/mm²
- Wind load: 45 m/S
- Rebar diameter: D16

To calculate the wind load per unit area, refer to "Road Bridge Specifications I Common Edition November 2017" and "Road Bridge Typhoon Design Handbook December 2007". Stress verification is performed at the top surface of the footing where the bending moment force and shear force acting on the frame are the largest. The results of the stress calculations confirm that both bending and shear are within the allowable values. (See **Table 2.10**)

Table 2.10 Stress verification results at the top of footing

	Calculation (N/mm ²)	Permissible level (N/mm ²)	Verification
Compression (Concrete)	1.176	< 10.000	OK
Compression (Rebar)	27.555	< 225.000	OK
Tension (Concrete)	-11.667	< 200.000	OK
Shear	0.04	< 0.43	OK

2.2.3 Equipment of CORS and data center

(1) CORS

Required specifications of CORS are shown in **Table 2.11**.

Table 2.11 Specification of CORS

Equipment	Number	Component (Main objective)	Required specification
GNSS Antenna	97*	Antenna for receiving radio signals from global positioning satellites	<ul style="list-style-type: none"> • Choke ring type suitable for multipath reduction, noise reduction, and multi-frequency reception
Receiver	97*	Equipment for receiving positioning information from global positioning satellites	<ul style="list-style-type: none"> • Positioning information from QZSS, GPS, GLONASS, BeiDou and Galileo satellites can be received. • Received signals: QZSS (L1C/A, L1C, L2C, L5), GPS (L1C/A, L1C, L2C, L2P, L5), GLONASS (L1C/A, L1P, L2C/A, L2P), BeiDou (B1I/C, B2a, B3), Galileo (E1, E5a, E5b, E5-

			Alt(BOC) • Output Format: RINEX2x, RINEX3x, RTCM2x, RTCM3x, NMEA-0183 • Data format resolution: At least 10 mm (approximate distance), 0.2 mm (carrier phase)
VPN/Mobile Router	97*	Equipment that distributes received positioning information via a virtual private line (wired/wireless)	• Internet connection via VPN • SIM (4G/5G) card slot
Power supply unit	94	Equipment that can remotely manage power to equipment	• Encrypted communications supporting IPsec protocol for data security in remote operations from a web browser
Uninterruptible Power Supply	97*	Equipment that can provide temporary power supply in the event of a power outage	• At least 1.6kWatts / 2.0kVA output for stable operation of receiver and VPN/Mobile router • Output voltage 220V to 240V • 24 hours standby function

*3 sets out of 97 provided to the Cambodia Government as stock

(2) Data Center

The server will be configured to meet the specifications of the CORS management software “PIVOT”, since it has the highest requirements. Two servers will be configured, with the first server as an active server and the second as a cold standby to ensure redundancy in the event of an active server down.

Since the data center will be located within MLMUPC's ministry LAN, access to the data center will be restricted and a firewall will be installed for internal use due to the need to ensure security.

The storage server shall provide disk space for at least three months of national CORS data and shall be fault-tolerant to prevent data loss due to failure.

Since the CORS data is a critical national asset, the configuration will have three layers of data security: first, disk space on a storage server; second, a backup copy to a data center owned by MLMUPC; and third, a backup copy to magnetic tape, which will provide three to four months of backup. By storing the tapes in a separate building, data loss can be prevented in the event of a fire or other building failure.

Based on the above, **Table 2.12** and **Figure 2.5** show the specifications and configuration of the equipment to be installed in the data center.

Table 2.12 Equipment plan of data center

Equipment	Number	Component (Major objective)	Required specification
Server	2	A server on which the CORS management software is installed. The configuration will consist of two servers, with the first server as an active server and the second server as a standby server to provide redundancy.	<ul style="list-style-type: none"> • Rack Servers • 2 CPUs with 16-24 cores/32-48 threads or more • Hard drive: 600GB or more SAS • Windows Server 2022
L3 Switch	1	Equipment to ensure independence of data center equipment and to connect to ministry LANs	<ul style="list-style-type: none"> • Layer 3, 24 x 10GbaseE ports • Rack type
Firewall	1	Grant access to only a limited number of members of the ministry.	<ul style="list-style-type: none"> • Firewall throughput: 10 Gbps • Rack type
Storage Server	1	The data storage will run as a database on the CORS management server and will be used for data storage.	<ul style="list-style-type: none"> • Hard Drives: 24 x 2.4TB SAS ISE 12Gbps in RAID6 • Rack type
Tape backup system	1	A device that stores data on magnetic tape. Back up CORS data on a regular basis and store it in a separate location to ensure data integrity.	<ul style="list-style-type: none"> • Supports LTO-8 or higher magnetic tape • 1 drive or more • Rack type

CORS Network Data Center

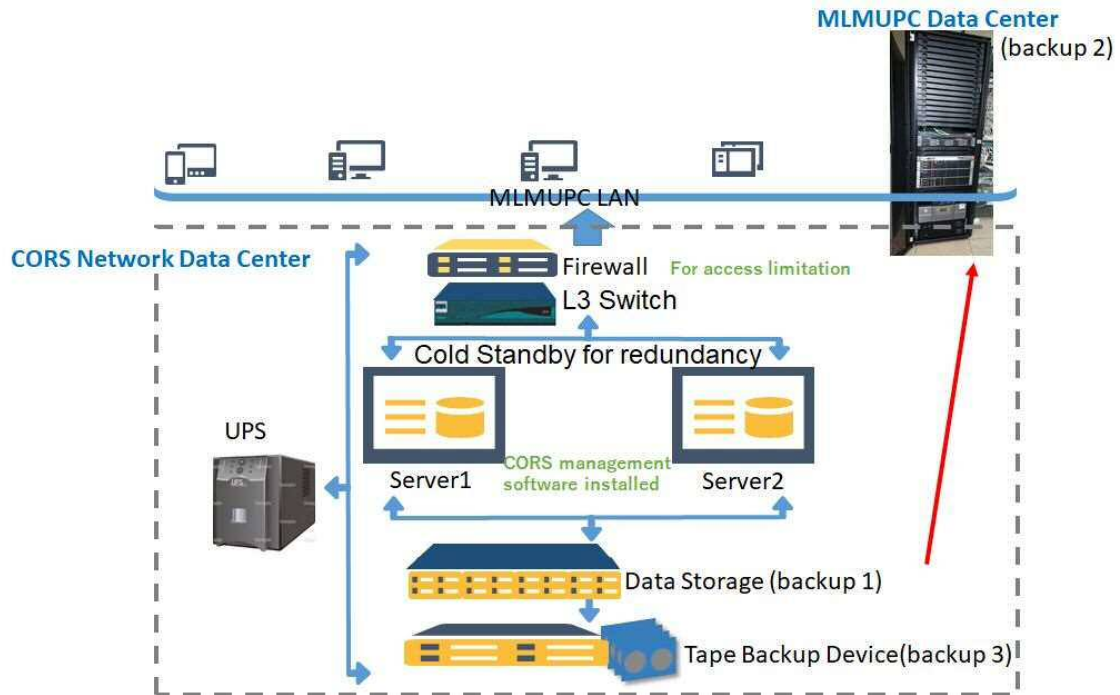
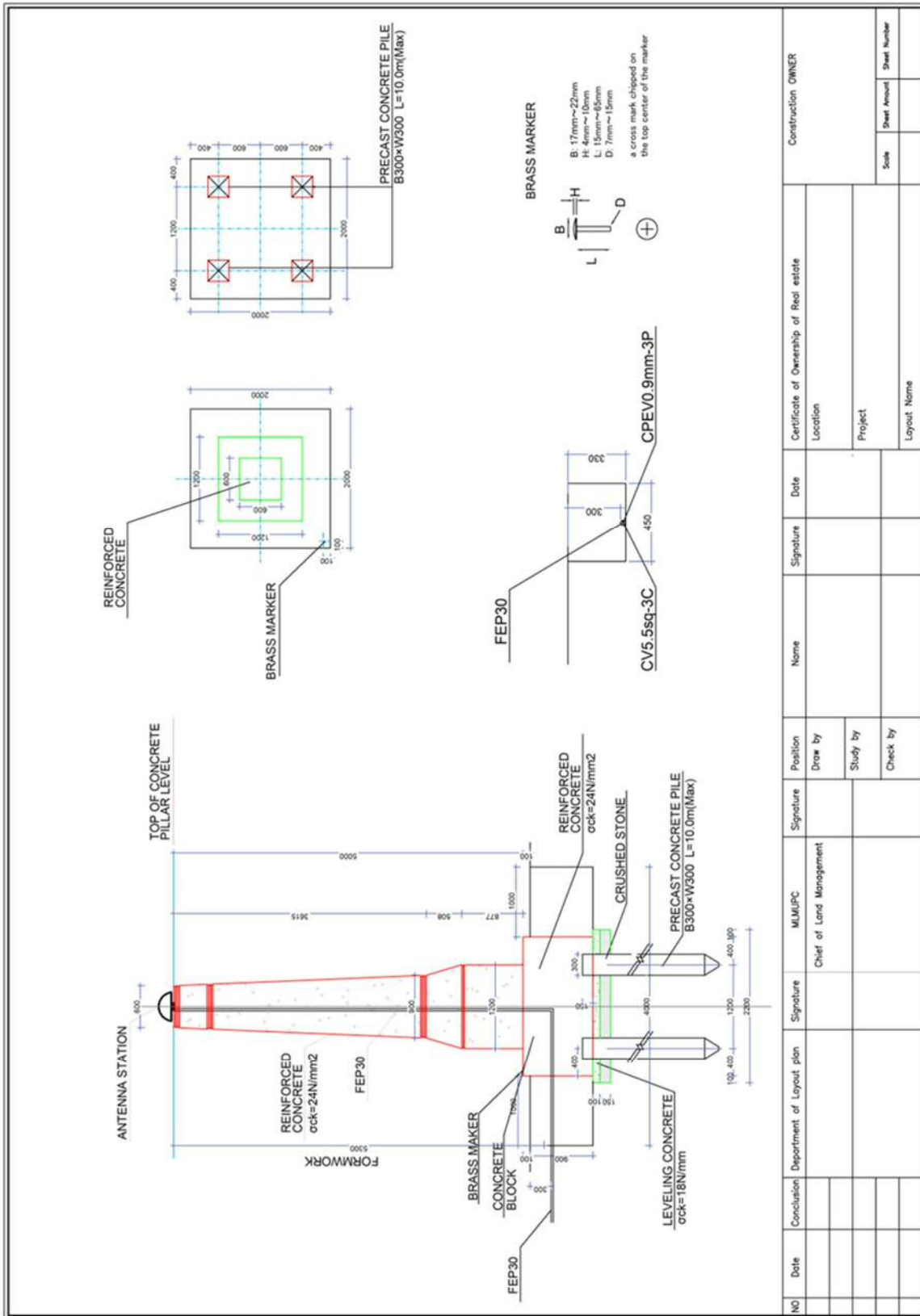


Figure 2.5 Conceptual Diagram of Data Center

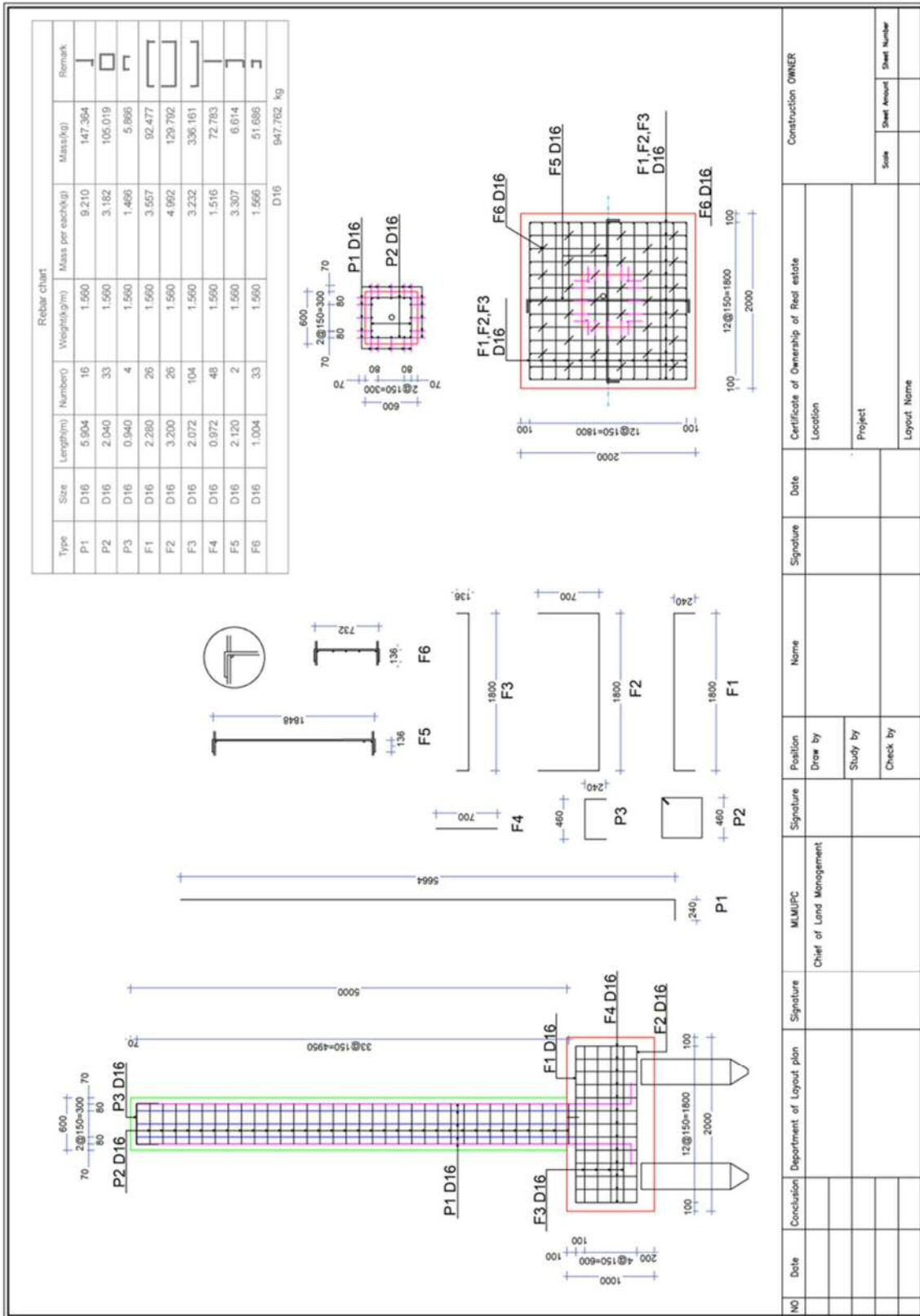
2.3 Drawing

Attached in the next pages.

The Project for the Establishment
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The Project for the Establishment
of Nationwide Continuously Operating Reference Station Network
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2.4 Implementation Plan

2.4.1 Implementation policy

The basic items to be considered when this project is implemented are as follows.

- This project will be implemented in accordance with the Japanese Grant Aid from the Government of Japan after the Exchange of Notes on Grant Aid for this project is concluded between the Government of Japan and the Government of Cambodia.
- The lead agency for this project is the MLMUPC.
- Consultant services for the detailed design, bidding-related work, and construction supervision of the project will be performed by a Japanese consultant under a consultant agreement with the Government of Cambodia.
- The project will be implemented by a Japanese contractor selected as a result of a bidding process by successful bidders who have passed the bidding qualification screening, with a construction contract with the Government of Cambodia.

The basic policies for the construction of this project are as follows.

- Procurement of civil engineering and construction materials, equipment, and labor shall be done locally at the lowest cost in Cambodia. If local procurement is not possible, the equipment shall be procured from Japan or a third country, whichever is most economical to the extent that the required quality can be ensured.
- Construction methods and processes shall take into account local construction projects, including the supply of materials, precast materials and equipment.
- Whenever possible, general construction methods that do not require special equipment or materials should be used.
- Establish appropriate construction specifications and construction management standards, as well as plan a construction management organization for the contractor's site and a construction supervision organization for the consultant that satisfies these standards.
- The safety of workers and third parties during construction shall be given top priority. In particular, environmental considerations and awareness raising regarding HIV/AIDS and COVID-19 will be conducted.
- Construction waste shall be disposed of at disposal sites designated by the Cambodian government.

2.4.2 Implementation conditions

(1) Points to keep in mind during construction.

In developing construction plans and methods, it is necessary to select plans that place the

highest priority on ensuring the safety of third parties and construction workers, and that reduce the burden of environmental impact on neighboring residents and users of the prefectural office.

- Clearly identify construction sites and construction-related areas (such as temporary yards) and implement measures to prohibit entry by all but construction-related personnel.
- Provide safety training for material transport vehicles to prevent traffic accidents.
- Ensure proper safety guidance during construction.
- Assign a watchman to prevent accidents when large construction equipment is in use.
- Backfill soil, crushed stone, and other construction materials to be used shall be selected in consultation with the executing agency, and appropriate locations shall be selected in consideration of environmental impacts.
- Almost all precast materials such as piles are manufactured in the suburbs of Phnom Penh and need to be transported to each site. During transportation, be careful of road conditions during the rainy season and damage during transportation.
- The coordinate of the newly established CORS is calculated based on the coordinate designated on the five CORS of the precedent technical project. Therefore, the utmost care will be taken not to cause displacement of the antennas of the existing five CORS during this survey and construction. Even if the antenna is removed once and reinstalled in the same position, slight changes in the antenna phase characteristics can result in changes in the coordinate values that exceed several centimeters. When inspecting for the purpose of referencing examples of prior work, special care should be taken not to approach or touch the site unnecessarily.

(2) Points to keep in mind during procurement.

- Since this project is a Grant Aid Project by Japan, tax exemption will be applied to the procurement of materials and equipment and the income of Japanese engineers. For imported materials and equipment, the project will require prior approval by the government authorities, and the procedures of the Cambodian government will be fully understood.
- In procuring equipment, the project will not only install the equipment, but also build and check the operation of the system, including cable connections.
- The contractor will provide coordinate values to CORS by GNSS surveying. Coordination of the coordinate values of the existing mark points and the coordinate values between CORSs (static surveying survey) will be carried out by the recipient country based on the technology transferred in the precedent technical project.
- After the pillar of the newly established CORS are sufficiently stable, the contractor shall perform a baseline analysis based on the same geodetic reference system

(ITRF2020 (International Terrestrial Reference Frame, International Earth Reference Frame), epoch separately indicated) as the five existing CORS using at least five days of RINEX data acquired at the 99 CORS. And calculate the coordinates of a newly established CORS. The calculation of the conversion parameters between the geodetic reference system of the existing markers and the geodetic reference system of the CORS will be carried out by the Cambodian government based on the technology transfer in the precedence technical project.

2.4.3 Scope of works

Table 2.13 shows the items that should be shared by both the Japanese and Cambodian governments.

Table 2.13 Burden categories of both governments

Items	Contents	Burden	
		Japan	Cambodia
Equipment and material procurement	Procurement and conveyance of equipment and material	✓	
Preparatory Survey	Securing the land necessary for construction		✓
	Securing disposal sites		✓
	Secure waste dumping sites		✓
	Other preparation works	✓	
Removal and relocation of construction obstacles			✓
Construction	Construction of CORS, installation of equipment, maintenance of equipment for data center, operation check	✓	

2.4.4 Consultant supervision

The Japanese consultant will perform detailed design work, bidding-related work, construction supervision, and software components based on a consultancy contract with the Cambodian government.

(1) Before bidding stage

The main contents of the implementation design work to be performed by the consultant are listed below.

a. Detail design

- Initiation discussions with Cambodian government, site survey, detailed design and others
- Geotechnical investigation (boring, geological survey)
- Procurement plan for materials and equipment, project cost estimation

- Soft component planning

b. Bidding procedure assistance

The major items of work to be performed during the period from the preparation of bid documents to the construction contract are listed below.

- Preparation of Bidding Documents
- Obtain counterparty approval for bidding documents.
- Publication of bids
- Prequalification of bidders
- Implementation of bidding
- Evaluation of bids
- Contract Promotion Services

(2) Supervision

The Consultant shall provide construction supervision for the work to be performed by the Contractor in accordance with the contract and construction plan. The main items are as follows.

- Verification and approval of construction plans
- Quality Control
- Process control
- Workmanship control
- Safety control
- Equipment installation and operation check

2.4.5 Quality Control Plan

Table 2.14 shows the quality control plan for the civil engineering part of the construction.

Table 2.14 Quality Control Plan

Material	Test	Method	Frequency
Cement	Standard specification for Portland cement	AASHTO M85	Once before test mixing Once when changed the material
Fine aggregate	Standard specification for fine aggregate for hydraulic cement concrete	AASHTO M6	Once before test mixing Once at every site
	Standard specification for sieve analysis of coarse and fine aggregates	AASHTO T27	Once at every site
Coarse	Standard method of test for	AASHTO	Once before test mixing

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aggregate	Rockwell superficial hardness of metallic materials	M80	Once at every site
	Standard specification for sieve analysis of course and fine aggregates	AASHTO T27	Once at every site
Water	Standard Method of Test for Quality of Water to Be Used in Concrete	AASHTO T26	Once before test mixing
Concrete	Standard Method of Test for Slump of Hydraulic Cement Concrete	AASHTO T119	Twice every day
	Standard Specification for Creosote Primer Used in Roofing, Damp proofing, and Waterproofing	AASHTO M121	Twice every day
	Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens	AASHTO T22	6 specimens per casting (3 specimens of 7-day timber order strength and 3 specimens of 28-day timber order strength)
	Temperature		Twice every day
	Salinity test		Twice every day
Reinforcement bar	Tensile testing of metallic materials	BS EN 10002-1	Per manufacturing unit
Precast pile	Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens	AASHTO T22	Per manufacturing unit

2.4.6 Procurement Plan

(1) Procurement plan of construction material

Most of the materials for civil construction can be procured within Cambodia. **Table 2.15** shows the procurement categories of major materials.

Table 2.15 Procurement plan of major construction materials

Item	Country			Source /Remarks
	Cambodia	Japan	Third Country	
Cement	✓			
Cement Additives	✓			
Aggregate	✓			
Sand	✓			
Wooden Frame	✓			
Reinforcement bar	✓			
Diesel	✓			
Petrol	✓			
Precast Concrete Pile	✓			Manufactured in Cambodia

(2) Procurement plan of construction equipment

All construction equipment can be procured in Cambodia, as shown in **Table 2.16**.

Table 2.16 Procurement plan of major construction equipment

Items	Description	Country		
		Cambodia	Japan	Third country
Backhoe	0.45~0.8 m ³	✓		
Giant breaker	1300 kg	✓		
Wheel loader	Bucket 1.5~1.6 m ³	✓		
Dump Truck	4~10 ton	✓		
Watering tank	8 m ³	✓		
Drum Mixer	0.4 m ³ /Batch	✓		
Vibration Roller	0.8~1.0 ton	✓		
Compressor	3.5~5.0 m ³ /min	✓		
Concrete breaker	Labour use model 75 kg	✓		
Generator	50~200 kvA	✓		
Pile Driving Diesel Hammer	For Precast RC	✓		
Rough terrain crane	25 ton	✓		
Freight truck	10 ton	✓		
Tampa	60 kg	✓		

(3) Procurement plan of equipment

The equipment procurement plan for this project can be roughly divided into two categories: those related to CORS and those related to the data center.

For equipment related to CORS (see **Table 2.17**), there is no local agency that has experience in procuring equipment for 94 points, the specification for this project, although 5 points were procured from a local agency in a pilot project by the precedence technical project. Since there exists a considerable risk to contract directly with a local company in terms of monetary value, it was decided to procure the equipment in Japan.

Interview to major manufacturers/suppliers with experience in delivering and installing CORS in Japan confirmed that the Japanese subsidiaries of each manufacturer/supplier are able to conclude a sales contract for the equipment with the contractor who will be awarded the main contract for this project. Therefore, it was confirmed that it is possible to procure the CORS equipment in Japan.

However, there is a possibility that the storage, transportation, and installation of the equipment in Cambodia may be outsourced to an IT-related company in Cambodia with whom has a business alliance. It was confirmed that even in the event of such outsourcing, the Japanese firm would remain liable under the sales contract to the main contractor.

On the other hand, the equipment to be provided to the data center (see **Table 2.18**) is a general

equipment that is widely used in public offices, private companies, and schools in Cambodia. The local distributor of the manufacturer has a sufficient delivery record. Since direct transactions with local distributors were considered feasible in terms of price, local procurement was selected.

Based on the above, the receivers and antennas for the CORS are planned to procure from Japan, while the equipment for the data center will be purchased from a local distributor in Cambodia and the software will be purchased through a local distributor or procured in Japan.

Table 2.17 Procurement for equipment of CORS

Items	Description		
	Cambodia	Japan	Third country
Receiver		✓	
VPN Mobile Router		✓	
Power supply unit		✓	
UPS (Incl. battery)		✓	
Lightning rod/arrester		✓	
Cable		✓	
Installation and setup costs		✓	
Operation check and adjustment cost		✓	
Spare equipment (receiver, antenna, VPN router, batteries)		✓	

Table 2.18 Procurement for equipment of data center

Items	Description		
	Cambodia	Japan	Third country
Server	✓		
Data Storage	✓		
Backup tape equipment	✓		
UPS	✓		
L3 Switching hub	✓		
Firewall	✓		
KVM Switch	✓		
CORS Maintenance /management software	✓	✓	

(4) Equipment transportation plan

Considering the on-site installation process, it is not efficient to transport the entire quantity of equipment related to the schedule of CORS construction. For this, the plan was made to ship the remaining half of the products by the second vessel while the installation work proceeds on site.

i International transportation

Transportation of equipment from Japan or a third country to Cambodia will be by

sea. All equipment handled in this project will be transported by sea in containers, so unloading will be at the Port of Sihanoukville or the Port of Phnom Penh, where unloading facilities are well equipped.

ii Domestic transportation (Cambodia)

Containerized cargo in Cambodia is transported by road using trailers or trucks. The cargo is unloaded at the warehouse of the consignee or local agent from the unloading point, and after checking the type, quantity, and damage of the cargo, it is transported by road to the equipment installation site according to the construction plan.

2.4.7 Initial operational guidance, operational guidance

Training for GDCG staff by the manufacturer's expert technicians is assumed for the operation of CORS and data center equipment and software, as well as operational guidance. It is not assumed that the equipment will be trained individually, but that training personnel will be dispatched and implemented under the responsibility of the awarded contractor. **Table 2.19** outlines the instruction methods and content.

Table 2.19 Guidance on operation of main equipment and software

Equipment/Software	Location	Training Contents	Training concept and method
GNSS Antenna /Receiver	CORS	Daily maintenance How to use	Equipment specialists or manufacturer's technical experts dispatched by the contractor will provide classroom and hands-on training to the relevant personnel (GDCG staff, etc.) in the presence of the consultant's equipment personnel. The entire training is expected to take approximately 3 days.
VPN	CORS	Daily maintenance How to use	
Power control unit	CORS	Daily maintenance How to use	
UPS	CORS	Daily maintenance How to use	
Lightning rod/arrester	CORS	Daily maintenance How to use	
Server	Data center	Daily maintenance How to use	
Storage	Data center	Daily maintenance How to use	Equipment specialists or manufacturer's technical experts dispatched by the contractor will provide classroom and hands-on training to the relevant personnel (GDCG staff, etc.) in the presence of the consultant's equipment
Backup tape equipment	Data center	Daily maintenance How to use	

UPS	Data Center	Daily maintenance How to use	personnel. The entire training is expected to take approximately 3 days.
Firewall	Data Center	Daily maintenance	
KVM Switch	Data Center	Daily maintenance	
CORS Maintenance Software	Data Center	How to use	Assume classroom and on-the-job training by the supplier's technical experts of the software to be introduced.

2.4.8 Soft Component Plan

(1) Responsibilities of the relevant organizations

In Cambodia, three organizations/projects, (1) the Precedent Technical Project, (2) the Japanese Grant Aid Project (this project), and (3) the GDCG, are working together to promote the development and utilization of a nationwide network of CORS. In this chapter, outline of the expected roles and results of each organization/project is summarized.

For CORS to be widely used in Cambodia, from the lesson obtain in Japan, the following efforts (services) are considered necessary after the CORS network is established.

Table 2.20 Services needed to promote the nationwide network of CORS

	Necessary service	Contents
1	Construction of 94 CORS, procurement of IT equipment and software for the Data Center	Construction and maintenance of CORS and provision of necessary software and equipment
2	Transmission of observation data to data center (via cable Internet, 3G/4G line)	Transmission of received data from positioning satellites to data centers
3	Coordinates of CORS	Calculate the coordinate values of 94 newly established CORS that are consistent with the coordinate values of 5 existing points and will serve as the standard for future surveying. The coordinate values of the brass markers were calculated by the project using network RTK.
4	Calculation of daily coordinates	Daily coordinate values are calculated based on daily observation data of each CORS to check the stability of the CORS and ground movement.
5	CORS Data Provision Service	Provide observation data (RINEX format), coordinate values, and operating information for CORS
6	Release of data on crustal deformation	Monitoring of ground movement over time using daily coordinate values (no major crustal movement due to earthquakes, etc. is expected in Cambodia)
7	Provide real-time data	Distribution of observation data (real-time data) at one-

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		second intervals of the CORS to those who need it
8	Providing observation data to IGS	Participation in international geodetic observation projects
9	Provide network RTK correction data	Distribution of CORS correction data that enables real-time, high-precision positioning to registered users.
10	Coordinate transformation service	Convert coordinate values based on the old coordinate system to the new coordinate system (requires calculation of conversion parameters)
11	User registration	Registration of users intends to receive services from the CORS
12	Fee collection service	Collection and management of registration fees from users

It is considered that the basic policies that each organization/project should address for the above services needed are as follows.

Table 2.21 Basic policies of each organization/project for the required services

Organization/Project	Basic policy	Achievement/Planned activities
Precedent Technical Project	<ul style="list-style-type: none"> • Establishment and transfer of the basic structure, data management system and technology, etc. of CORS in Cambodia 	<ul style="list-style-type: none"> • Five CORS have been maintained as a pilot. • PIVOT (from Trimble) has been installed as CORS management software. • Data center in place
Japanese Grant Aid (this Project)	<ul style="list-style-type: none"> • Construction of a nationwide network of CORS, provision of equipment and software for data management, and transfer of technology necessary for maintenance and management 	<ul style="list-style-type: none"> • Provide 94 CORS and a data center • Provide CORS management software • Operation check of equipment and software
GDCG	<ul style="list-style-type: none"> • Establishment and dissemination of technology transferred through the Precedent Technical Project • Promoting the use of CORS 	<ul style="list-style-type: none"> • Operation and maintenance of 99 CORS, including pilot

Based on the above, **Table 2.22** shows the efforts of each organization/project in each service.

Table 2.22 Organization/project-specific role assignments

S/N	Type of Service	Technical Cooperation		Grant Aid		GDCG	Remarks
		Achievement	Further input	Consultants	Bidding Entity		
1	Construction of 94 CORS, procurement of IT equipment and software for the Data Center	Establishment of 5 CORS and Data Center		(Construction) 94 points selection, design, cost estimation, bid documents, construction management, PMR preparation support. (Training) Daily management and repair	CORS construction, equipment procurement and installation CORS management software (CORS 94 points + 5points)*	Responsibilities as a client of the project	
2	Transmission of observation data to data center (via cable Internet, 3G/4G line)	Introduction of PIVOT (MAX 7 CORS, 100 users)		(Training) Software Operation	Equipment operation/adjustment	Review of organization Secure budget	
3	Coordinates of CORS	Calculate the coordinate values considering 5 CORS networks	Technology transfer for calculation of coordinate values based on ITRF2020**.	Verification of GNSS / attached reference point coordinate values	Coordinates of GNSS Setting of attached reference point Site description		Request short-term experts as needed
4	Calculation of daily coordinates	Introduction of PIVOT Bernese (University of Bern) on one server		(Training) Software Operation	Equipment operation/adjustment	Authorize coordinate values for 94 points based on transferred technology	
5	CORS Data Provision Service	Introduction of PIVOT		(Training) Software Operation	Equipment operation/adjustment	Implementing Entity	
6	Release of data on crustal deformation	N/A	N/A	N/A	N/A		
7	Provide real-time data	Introduction of PIVOT		(Training) Software Operation	Equipment operation/adjustment	Implementing Entity	

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8	Providing observation data to IGS***	Introduction of IGS	N/A	N/A	N/A	Application to IGS	
9	Provide network RTK correction data	Introduction of PIVOT		(Training) Software Operation	Equipment operation/adjustment	Implementing Entity	
10	Coordinate transformation service	Parameters calculated for 5 points	Technology transfer regarding parameter calculation methods	(Training) Software Operation	Equipment operation/adjustment	Authorize coordinate values for 94 points based on transferred technology.	Request short-term specialists as needed
11	User registration	Introduction of PIVOT		(Training) Software Operation	Equipment operation/adjustment Function Building	Implementing Entity	
12	Fee collection service	Introduction of PIVOT		(Training) Software Operation	Equipment operation/adjustment Function Building	Implementing Entity	

* The manufacturer of COR and management software has not yet been selected, but if the management software for the existing 5 points is changed from PIVOT, 99 points including the existing 5 points will be managed.

** ITRF2020 : International Terrestrial Reference Frame

*** IGS: International GNSS Service, an international academic organization that manages and publishes GNSS observation data and orbital information.

(2) Action Plan of the Soft Component

It is assumed that the operation checks and adjustments of the provided equipment as indicated in (1) above will be carried out by the awarded firms based on the contract. Therefore, in the software component, the GDCG the recipient organization will take the lead in the technical transfer to ensure that the CORS and equipment are maintained, and that the data transmitted and received are properly managed.

The five CORS and the data center have been established in the precedent technical project. A basic system for network management of CORS, reception and transmission of data from positioning satellites, and information provision services has been established. Furthermore, and knowledge on operation and maintenance of the system has been accumulated.

The purpose of this project is to ensure that the 99 CORS, 94 of which have been developed and 5 of which are existing, can be operated and maintained in a stable manner.

The expected results in the soft component are given bellow.

- i At the local office where the CORS is installed, local engineers will understand the expected results of the CORS and be able to properly manage the CORS on a daily basis.
- ii At the data center, appropriate maintenance and repair of CORS will be possible for the 99 points, including the 94 points to be developed under the Project and the existing 5 points.
- iii Data management such as data transmission/reception and provision can be properly managed at the data center.

The training will be a combination of classroom and field training, and the following manuals and other documents are planned as deliverables. The manual will be prepared in the form of a workshop led by the data center staff, and the content will be based on the knowledge and results of the precedent technical project.

- CORS Maintenance Manual (for local engineers and data center staff)
- CORS Maintenance and Repair Manual (for data center staff)
- CORS Operation Manual (for data center staff)

One Japanese expert is planned to give three lectures per outcome. **Table 2.23** provides an overview of the soft component activities (input plan). **Tables 2.24, 2.25, and 2.26** also outline the schedule of activities for each trip.

Table 2.23 Activity plan of soft component

Output		Contents of the Activities					Resource	Delivery
		Required Engineering /filed	Current and required engineering level		Target group	Method		
			Current level	Required level				
1. Daily maintenance of CORS	Japan	Facility management	—	—	—		Expert 0.9MM	—
	Cambodia	Facility management	No experience	Daily management of CORS, record keeping, reporting	District and province officers	Classroom and field training/Workshop prepare manuals	<ul style="list-style-type: none"> • (District 94×2 person, province 25×1 person)×1 day (classroom training) • Data center 5 persons×3days (Preparation of manual) 	CORS Daily maintenance manual
2. Maintenance and repair works of CORS	Japan	Facility management	—	—	—		Expert 0.9MM	—
	Cambodia	Facility management	Identification of malfunctions and the need for repairs	Identification of cause and repair method, ordering and verification of repair work	Data center officers	Classroom and field training/Workshop prepare manuals	<ul style="list-style-type: none"> • Data Center Officers 3 persons ×1 day (Training) • Data Center officers 3 persons ×3 days (Preparation of manual) 	CORS Maintenance and repair manual
3 Data management	Japan	Positioning technology	—	—	—		Expert 1.37MM	—
	Cambodia	Positioning technology	System constructed in precedent technical project	Refer to Table 2.21	Data center officers	Classroom and field training/Workshop prepare manuals	<ul style="list-style-type: none"> • Data Center Officers 3 persons ×3 days (Training)) • Data center officers 3 persons × 4 days (Preparation of manual) 	CORS Operation Manual

Table 2.24 Daily Maintenance Activities Schedule (Ouput-1)

days	Contents	remarks
1	Travel (Tokyo→XXX)	
2	Travel (XXX→Phnom Penh)	
3	Meeting with JICA Cambodia Office Meeting with GDCG	
4	Preparation of training material	Confirmation of the progress of the technical cooperation project, structure of District and Province
5	Preparation of training material	Identification of maintenance items and coordination with GDCG
6	(Documentation)	
7	(Documentation)	
8	Preparation of training material	Confirmation of maintenance methods, Meeting with GDCG
9	Preparation of training material	Preparation of presentation material (PPT)
10	Preparation of training material	Preparation of presentation material (PPT)
11	Consultation and coordination with GDCG (modification and approval)	
12	Preparation of training	
13	(Documentation)	
14	(Documentation)	
15	Preparation of training	
16	Lecture and practical training (CORS daily management)	For province and district engineers and data center personnel
17	Workshop implementation (guideline compilation)	Cooperation with the data center personnel
18	Workshop implementation (guideline compilation)	Cooperation with the data center personnel
19	Workshop implementation (guideline compilation)	Cooperation with the data center personnel
20	(Documentation)	
21	(Documentation)	
22	Reporting	
23	Reporting	
24	(Extra day)	
25	Report to JICA Cambodia office, GDCG, etc.	
26	Travel (Phnom Penh→XXX)	
27	Travel (XXX→Tokyo)	

Table 2.25 Periodic and repair works activity schedule (Output-2)

Day	Contents	remarks
1	Travel (Narita→XXX)	
2	Travel (XXX→Phnom Penh)	
3	Meeting with JICA Cambodia Office Meeting with GDCG	
4	Preparation of training material (Confirm contents of technical cooperation, Confirmation of communication system)	
5	Preparation of training material (Ordering system, Confirmation of post-repair acceptance inspection system)	
6	(Documentation)	
7	(Documentation)	
8	Preparation of training material (Repair management records, analysis of failure causes)	
9	Preparation of training material (Preparation of PPT)	
10	Preparation of training material (Preparation of PPT)	
11	Meeting with GDCG (Confirmation of contents of training material)	
12	Preparation of training	
13	(Documentation)	
14	(Documentation)	
15	Preparation of training	
16	Classroom /Field Training (COR repair skills)	Oriented to data center officers
17	Workshop (Preparation of guideline)	Oriented to data center officers
18	Workshop (Preparation of guideline)	//
19	Workshop (Preparation of guideline)	//
20	(Documentation)	
21	(Documentation)	
22	Reporting	
23	Reporting	
24	(Additional day)	
25	Report to JICA Cambodia Office and GDCG	
26	Travel (Phnom Penh→XXX)	
27	Travel (XXX→Tokyo)	

Table 2.26 Data management of CORS activity schedule (Output-3)

Day	Contents	remarks
1	Travel (Narita→XXX)	
2	Travel (XXX→Phnom Penh)	
3	Meeting with JICA Cambodia Office Meeting with GDCG	
4	Preparation of training materials (Confirm contents of technical cooperation, operation of CORS management software)	
5	Preparation of training materials (operation of CORS management software)	
6	(Documentation)	
7	(Documentation)	
8	Preparation of training materials (GNSS coordinate, Calculation of coordinate of Brass Marker)	
9	Preparation of training materials (daily coordinates)	
10	Preparation of training materials (Realtime data)	
11	Preparation of training materials (RTK adjustment data)	
12	Preparation of training materials (User registration)	
13	(Documentation)	
14	(Documentation)	
15	Preparation of training materials (User fee collection system)	
16	Preparation of training materials (Data management)	
17	Preparation of training materials (Preparation of PPT)	
18	Preparation of training materials (Preparation of PPT)	
19	Preparation of training materials (Preparation of PPT)	
20	(Documentation)	
21	(Documentation)	
22	Meeting with GDCG (Confirmation of the training materials)	
23	Preparation of training	
24	Preparation of training	
25	Classroom and field training (CORS management software, GNSS and Brass Marker coordinate)	Oriented to data center officers
26	Classroom and field training (Daily coordinates, Real time data, RTK data)	Oriented to data center officers
27	(Documentation)	
28	(Documentation)	
29	Classroom and field training (Coordinate transformation, User registration, fee collection)	Oriented to data center officers
30	Classroom and field training (Preparation of Guideline)	Oriented to data center officers
31	Workshop (Preparation of Guideline)	Oriented to data center

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		officers
32	Workshop (Preparation of Guideline)	Oriented to data center officers
33	Workshop (Preparation of Guideline)	Oriented to data center officers
34	(Documentation)	
35	(Documentation)	
36	Reporting	
37	Reporting	
38	(Additional date)	
39	Report to JICA Cambodia Office and GDCG	
40	Travel (Phnom Penh→XXX)	
41	Travel (XXX→Tokyo)	

2.4.9 Implementation Schedule

The implementation schedule for design and construction is shown in **Table 2.27**.

Table 2.27 Implementation Schedule

		1	2	3	4	5	6	7	8	9																	
Detail Design	Site Investigation	████████████████																									
	Bidding procedure1				████████████																						
	Bidding procedure2								████████████																		
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
Construction	Preparation	██████████																									
	Procurement of materials	██████████																									
	Material and equipment transport			██																							
	Equipment procurement				██																						
	CORS				██																						
	Data Center										██																
	Operation Check					██																					
	Closure																					██					
Soft Component											██																

2.5 Safety Plan

To ensure construction safety, the contractor shall develop a safety management plan in accordance with JICA's Guidance on Safety Management for ODA Construction Projects. The contractor shall obtain approval from the client and consultant, and implement safety management actions based on the plan.

The Consultant shall conduct construction safety management guidance (safety patrols) twice, at the start of construction and in the interim, to confirm the safety management system at the site in accordance with the "Safety Measures Plan" and "Safe Construction Plan" by the construction company.

3 Obligation of recipient country

3.1 Matters borne by the recipient country.

The following are the items to be borne by the Cambodian side.

<Before construction>

- a. To bear bank charges for opening an account in Japan.
- b. Relocation of utilities (utility poles, power lines, lighting poles, etc.) that would interfere with the implementation of the project.
- c. Installation of electricity supply within 50m apart from the planned CORS installation location.
- d. Provide information necessary for the implementation of the Project
- e. Provision of temporary material storage and construction areas by location
- f. Provision of information on quarries and industrial waste disposal sites necessary for the Project

<During construction>

- g. Provision of duty exemption, customs clearance, and measures for prompt domestic transportation of materials and equipment for the Project
- h. Legal measures necessary for the entry and stay in Cambodia of Japanese nationals and third country nationals authorized by the Government of Cambodia engaged in the Project
- i. Obtaining or issuing permits and approvals necessary to implement the Project (e.g., construction permits, permits for traffic control during site construction, etc.)
- j. Cooperation in resolving any problems with residents or third parties that may arise in the implementation of the Project.

< After handover >

- k. proper use and maintenance of the CORS after handover
- l. Exterior improvements such as fencing, block, tile, etc., if needed

Figure 3.1 Implementation process of the recipient country's burden items

		1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12
EN/GA	▼								
Detail Design									
Bidding				▼					
Construction									
a.	▼								
b.				▼					
c.				▼					
d.				▼					
e.				▼					
f.				▼					
g.									
h.									
i.									
j.									
k.									(After handover)
l.									(After handover)

3.2 TAX exemption

Since this project is implemented as Japanese Grant Aid Project, the following items should be exempt from taxation.

- Corporate income tax for Japanese and third country companies involved in the Project
- Personal income tax for Japanese and third country nationals involved in the Project
- Value Added Tax (VAT) on the Project
- Fuel tax on the Project
- Import duties related to the project.

4 Project Operation and Maintenance Plan

Although GDCG is expected to be the contracting authority of the project, it is assumed that the

province or the district office where CORS shall be instructed will take the responsibility of its daily maintenance. On the other hand, in case of damage, it is assumed that GDCG will repair the pillar or replace the equipment based on the maintenance contract with the private service provider.

Items of daily maintenance of CORS are given as follows:

- Pruning of trees around the antenna to ensure good reception of satellite signals.
- Weeding and removal of accumulated sediment and debris to facilitate inspection of CORS.

There is no routine maintenance of the equipment, and if a malfunction is detected, the equipment is adjusted or replaced based on the maintenance contract.

5 Project Cost Estimation

5.1 Expenses borne by the Cambodia side.

Expenses borne by Cambodia.

Change of power supply location	Approx.64,623USD (Approx.9 Mil JPY)
<u>Bank commission</u>	<u>Approx. 9,751 USD (Approx. 1 Mil JPY)</u>
Total	Approx. 778,043 USD (Approx.10 Mil. JPY)

5.2 Condition of cost estimation

- a. Base month of cost estimation : October 2022
- b. Exchange Rate : 1 USD = 139.27 JPY
- c. Project Period : The detailed design and construction duration are shown in **Table 3.1**.
- d. Others : The cost estimation shall be carried out based on the grant aid system of the Government of Japan. This project does not assume any contingencies.

5.3 Operation and Maintenance Cost

It is anticipated that the data center staff will be responsible for periodic inspection and repair of CORS established in this project. However, due to the limited manpower, it is considered there is a difficulty to manage it by force account. Therefore, preparing management contract with private service provider is recognized more realistic. This cost is expected to be US\$184,000 per year, or approximately 20.4% of GDCG's annual budget. While this is hardly a small amount of money for GDCG, GDCG has indicated that it can cover this expense from the registration fees it collects from the CORS users.

By granting a two-year defect liability period to the equipment in this project, it is evaluated that there will be no major challenges to the income and expenditure for maintenance and management, even when considering the deterioration of the equipment (here assumed to be maximum 10% each year), as shown in **Table 5.1**.

Table 5.1 Operation and Maintenance Plan after Installation of CORS (Draft)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033
<Income>									
User No.	700	980	1,274	1,835	2,201	2,422	2,664	2,930	3,233
Register Fee (USD)	250	250	275	303	333	333	333	333	333
Total (USD)	175,000	245,000	350,350	556,005	732,933	806,526	887,112	975,690	1,076,589
<Expenditure>									
Contract Service Provider	0	0	184,000	184,000	184,000	184,000	184,000	184,000	184,000
Maintenance (Force Account)	46,579	46,579							
Replacement	0	0	425,297	425,297	425,297	425,297	425,297	425,297	425,297
Total (USD)	46,579	46,579	609,297	609,297	609,297	609,297	609,297	609,297	609,297
<Balance>	128,421	198,421	-258,947	-53,292	123,636	197,229	277,815	366,393	467,292
<Transferred>	128,421	326,842	67,896	14,604	138,240	335,469	613,284	979,677	1,446,969

Source: Prepared by The JICA study team based on CORS Operation and Maintenance Plan (2022) prepared by GDCG.

Until the third year after handover, the maintenance and management service contract made with the service provider, the daily management and emergency repairs due to lightning strikes and others, it considered to be carried out directly by the GDCG. The daily maintenance will include weeding and pruning, as the growth of the trees may interfere with radio reception. As for damage to the antenna due to lightning strikes, three antenna parts are planned to be provided, and the main task will be to replace the damaged parts. For this reason, only labor costs are assumed to be incurred. The following is a list of anticipated inspection items and necessary expenses.

Table 5.2 Main maintenance items and annual costs for CORS

Maintenance Items	Frequency	No. of Inspect or	Major equipment	Quantity	Unit Cost (Thousand JPY)	Cost (Thousand JPY)
Weeding/Pruning	4 times annually	1	Spade, Pruning shear	Total 4 per side×94 sites	63	5,922
Antenna damage due to lightning strike	Appropriately	1	Common tools	1 site annually	5,000	5,000

6 Project Evaluation

6.1 Pre-conditions

It is a prerequisite that the recipient country's responsibilities are implemented according to

schedule. The main contents are listed below. Details of other responsibilities to be borne by the counterparties are shown in "3.1 Matters borne by the recipient country".

- Replace the power supply location
- Site provision
- Bidding procedures

6.2 Necessary Inputs by Recipient Country

The following are issues that Cambodia side needs to address in order to fully reveal and sustain the project's benefits.

- Ensure the number of users in line with the plan
- Enter into maintenance contracts with private service providers and secure budget
- Continually review and update management manuals/guidelines, etc.

6.3 Important Assumptions

GDCG plans to raise the necessary maintenance costs by encouraging users who wish to receive CORS services to register and by charging a registration fee (\$250/person/year). However, it is estimated that at least 790 users will be required to sign up for maintenance and management services. Therefore, if the number of users does not reach 790, the necessary maintenance and management services may not be obtained.

6.4 Project Evaluation

6.4.1 Relevance

For the following reasons, the implementation of the project through Japan's Grant Aid is judged to be appropriate.

- a. The Project will enable highly accurate and efficient surveying and mapping, including cadastral surveying, throughout Cambodia. At the same time, the Project will contribute significantly to the realization of efficient infrastructure development in the country by providing an information infrastructure for the digitization and advanced utilization of geospatial information. The project is expected to accelerate the country's economic growth, which will benefit a wide range of people, and is expected to benefit a large number of people, not biased toward a specific segment of the population.
- b. This project corresponds to the development of economic infrastructure that is indispensable for realizing the priority areas (medium-term goals) of Japan's Country Assistance Policy for Cambodia, namely "support for industrial development" and "improvement of the quality of life". It is also in line with the concept of "high quality infrastructure" as specified in the Country Assistance Policy Notes and the Outline of

Development Cooperation (cabinet approved on 9th June 2023).

- c. This project is based on the results of technology transfer accumulated through earlier technical cooperation projects and will contribute significantly to achieving the development goals of the Cambodian government, including the National Strategic Development Plan (NSDP) and the Industrial Development Policy (IDP).

6.4.2 Effectiveness

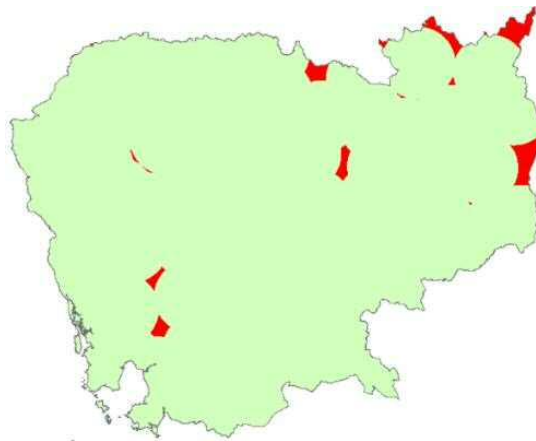
The implementation of this project is expected to have the following effects.

[Quantitative Evaluation]

Table 6.1 shows the quantitative evaluation (draft) for the project.

Table 6.1 Quantitative evaluation of the Project

Indicator	Baseline (2023)	Target Value (2028: 3 years after handover)
Number of CORS in whole country	5	99
Coverage area within a 40 km radius of single CORS	5,024km ² (Approx, 2.8% of entire land)	177,867km ² (Approx. 98.1% of entire land) ※Refer to Figure 6.1
Number of CORS Users	338	1200



(Green color represents the area covered)

Figure 6.1 40 km radius of total coverage area

[Qualitative Evaluation]

The qualitative effects of the implementation of this project are as follows.

- a. The introduction of CORS is expected to reduce surveying time in cadastral surveying and increase the number of land transactions that can be handled. This will improve administrative services.
- b. The introduction of new surveying techniques such as networked RTK-GNSS (a method that enables a single surveyor to acquire position coordinates in a short time. Become able by obtaining a network CORS), surveying will speed up and improve the efficiency of various surveying tasks in Cambodia.
- c. Improved efficiency in obtaining location coordinates will lead to digitization of the subsequent process of map creation, and the development of geospatial information will progress.
- d. The digitization of surveying and geospatial information will lead to increased productivity and promote the development of roads and other infrastructure because of the implementation of ICT construction at construction sites.
- e. Enables efforts to provide services that utilize location information using CORS, such as automated operation of agricultural machinery and drone deliveries to areas that are difficult to reach by land due to flooding.

To summarize these quantitative and qualitative evaluations of effectiveness, the number of CORS installed increases to 20 times more in three years, and the area that can benefit from the scaling up increases by 35 times covering almost all of Cambodia. Hence, this will result in a reduction in the time required for various surveys, including cadastral surveying, which will lead to improved administrative services. This is a direct effect of the project. At the same time, the ripple effect is expected to promote the digitization of surveying and geospatial information in Cambodia, accelerate the development of roads and other infrastructure, and build a foundation for providing location-based services such as automatic driving, thereby contributing to industrial development in the country.

Considering the above, the implementation of this project is judged to be effective.

APPENDIX

Attachment-1: Name and position of study team members

Attachment-2: Itinerary and contents of the study

Attachment-3: Name and position of members of the recipient country

Attachment-4: Minutes of Discussion (M/D)

Attachment-5: Technical Note

Attachment-6: Evaluation of CORS candidate sites

Attachment-7: Rainfall data

Attachment-1: Name and position of study team members**1-1. First Site Survey (From 17th September, 2022 to 16th October, 2022)**

Position	Name	Organization
Team Leader	KUMAGAI Hidenori	JICA Infrastructure Management Department
Cooperation Planning 1	SAKABE Shinichi	JICA Infrastructure Management Department
Cooperation Planning 2	MIZUGUCHI Yuta	JICA Infrastructure Management Department
Chief Consultants / Utilization Planning	OGAWA Motoki	Eight-Japan Engineering Consultants Inc.
CORS Distribution Planning / CORS Equipment Planning	SATO Jun	Infrastructure Development Institute-Japan
Data Center Planning	SATO Kei	Pasco Corporation
CORS Design / Construction Plan	MUSHA Jun	Pasco Corporation (Asia Air Survey Co.,Ltd.)
Procurement Planning / Cost Estimate	MINAMI Teruaki	Eight-Japan Engineering Consultants Inc.

1-2 Second Site Survey (From 17th May, 2023 to 26th May, 2023)

Position	Name	Organization
Team Leader	KUMAGAI Hidenori	JICA Infrastructure Management Department
Cooperation Planning	MIZUGUCHI Yuta	JICA Infrastructure Management Department
Chief Consultants / Utilization Planning	OGAWA Motoki	Eight-Japan Engineering Consultants Inc.
CORS Distribution Planning / CORS Equipment Planning	SATO Jun	Infrastructure Development Institute-Japan

Appendix 2 Itinerary and contents of the study

2-1. First Site Survey (From 17th September, 2022 to 16th October, 2022)

Date	JICA	Consultants				
		Chief Consultants/ Utilization Planning	CORS Distribution Planning / CORS Equipment Planning	Data Center Planning	CORS Design / Construction Plan	Procurement Planning / Cost Estimate
	Kumagai, Sakabe, Mizuguchi	Ogawa	Sato (Jun)	Sato (Kei)	Musha	Minami
17th Sep. (Sat)		Depart Narita	Depart Narita		Depart Narita	
18th Sep. (Sun)		Arrive Singapore Depart Singapore Arrive Phnom Phen	Arrive Singapore Depart Singapore Arrive Phnom Phen		Arrive Singapore Depart Singapore Arrive Phnom Phen	
19th Sep. (Mon)		Discussion with MLMUPC/ GDCG	Discussion with MLMUPC/ GDCG		Discussion with MLMUPC/ GDCG	
20th Sep. (Tue)		Discussion with MLMUPC/ GDCG	Discussion with MLMUPC/ GDCG		Discussion with MLMUPC/ GDCG	
21st Sep. (Wed)		CORS Establish Candidate Site Survey	CORS Establish Candidate Site Survey		Technical Cooperation Project Survey	
22nd Sep. (Thu)		CORS Establish Candidate Site Survey	CORS Establish Candidate Site Survey		Technical Cooperation Project Survey	
23rd Sep. (Fri)		Preparation to sub-contract	CORS Establish Candidate Site Survey		Technical Cooperation Project Survey	
24th Sep. (Sat)		Site observation	Site observation		Site observation	
25th Sep. (Sun)		Site observation	Site observation		Site observation	
26th Sep. (Mon)	Depart Narita Arrive Incheon Depart Incheon Arrive Phnom Phen	Data filing	Data filing	Depart Narita	Data filing	
27th Sep. (Tue)	Meeting with JICA Cambodia Office Discussion with MLMUPC/GDCG Observation of Data Center	Meeting with JICA Cambodia Office Discussion with MLMUPC/GDCG Observation of Data Center	Meeting with JICA Cambodia Office Discussion with MLMUPC/GDCG Observation of Data Center	Arrive Singapore Depart Singapore Arrive Phnom Phen	Meeting with JICA Cambodia Office Discussion with MLMUPC/GDCG Observation of Data Center	
28th Sep. (Wed)	Discussion with MLMUPC/ GDCG Observation of current CORS Meeting with Technical Cooperation Team	Discussion with MLMUPC/ GDCG Observation of current CORS Meeting with Technical Cooperation Team	Deployment plan of CORS by navigational chart	Confirmation of the specification of the equipment and organization structure of data center	Consideration of the planning and design condition	
29th Sep. (Thu)	Internal Meeting	Internal Meeting Subcontracting arrangements	Deployment plan of CORS by navigational chart	Confirmation of the specification of the equipment and organization structure of data center	Consideration of the planning and design condition	
30th Sep. (Fri)	Participant to seminar of the technical corporation project	Participant to seminar of the technical corporation project	Participant to seminar of the technical corporation project	Participant to seminar of the technical corporation project	Participant to seminar of the technical corporation project	
1st Oct. (Sat)	Site observation	Site observation	Site observation	Site observation	Site observation	Depart Narita
2nd Oct. (Sun)	Data filing	Data filing	Data filing	Data filing	Data filing	Arrive Singapore Depart Singapore Arrive Phnom Phen
3rd Oct. (Mon)	Minutes discussion with MLMUPC/ GDCG	Minutes discussion with MLMUPC/ GDCG	Minutes discussion with MLMUPC/ GDCG	Consideration of data center specification and	Consideration of the planning and design condition	Construction Unit Price Survey

	Report to Embassy of Japan	GDCG Report to Embassy of Japan	GDCG Report to Embassy of Japan	visit IT vendors		
4th Oct. (Tue)	Signing on the M/D Report to JICA Cambodia Office Depart Phnom Penh	Signing on the M/D Report to JICA Cambodia Office	Signing on the M/D Report to JICA Cambodia Office	Consideration of data center specification and unit price of equipment	Outline design and quantity survey	Construction Unit Price Survey
5th Oct. (Wed)	Arrive Incheon Depart Incheon Arrive Narita	Observation of existing CORS	Composition of CORS equipment	Visit and discussion with IT vendors, Unit Price of equipment	Outline design and quantity survey	Interview to local contractors Building construction plan
6th Oct. (Thu)		Soft Component	Composition of CORS equipment	Visit and discussion with IT vendors	Outline design and quantity survey	Interview to local contractors Building construction plan
7th Oct. (Fri)		Soft Component	Composition of CORS equipment	Visit and discussion with IT vendors	Outline design and quantity survey	Interview to local contractors Building construction plan
8th Oct. (Sat)		Data filing	Data filing	Data filing	Data filing	Data filing
9th Oct. (Sun)		Data filing	Data filing	Data filing	Data filing	Data filing
10th Oct. (Mon)		CORS Utilization Survey	Composition of CORS equipment	Equipment Unit Cost, Calculation of maintenance and management costs	Cost estimation	Natural condition survey
11th Oct. (Tue)		CORS Utilization Survey	Composition of CORS equipment	Equipment Unit Cost, Calculation of maintenance and management costs	Cost estimation	Natural condition survey
12th Oct. (Wed)		Discussion with MLMUPC/ GDCG of technical note	Discussion with MLMUPC/ GDCG of technical note	Visit and discussion with IT vendors	Discussion with MLMUPC/ GDCG of technical note	Discussion with MLMUPC/ GDCG of technical note
13th Oct. (Thu)		Discussion with MLMUPC/ GDCG of technical note	Discussion with MLMUPC/ GDCG of technical note	Visit and discussion with IT vendors	Discussion with MLMUPC/ GDCG of technical note	Import duty and duty exemption procedures
14th Oct. (Fri)		Signing on the technical note	Signing on the technical note	Visit and discussion with IT vendors	Signing on the technical note	Import duty and duty exemption procedures
15th Oct. (Sat)		Depart Phnom Penh Arrive Singapore Depart Singapore	Depart Phnom Penh Arrive Singapore Depart Singapore	Depart Phnom Penh Arrive Singapore Depart Singapore	Depart Phnom Penh Arrive Singapore Depart Singapore	Depart Phnom Penh Arrive Singapore Depart Singapore
16th Oct. (Sun)		Arrive Narita	Arrive Narita	Arrive Narita	Arrive Narita	Arrive Narita

2-2. Second Site Survey (From 16th May, 2023 to 26th May, 2023)

Date	JICA	Consultants	
		Chief Consultants/ Utilization Planning	CORS Distribution Planning / CORS Equipment Planning
	Kumagai, Mizuguchi	Ogawa	Sato (Jun)
5/16 th May (Tue)		Depart Haneda	Depart Haneda
5/17 th May (Wed)	Depart Narita Arrive Incheon Depart Incheon Arrive Phnom Penh	Arrive Singapore Depart Singapore Arrive Phnom Penh	Arrive Singapore Depart Singapore Arrive Phnom Penh
5/18 th May (Thu)	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG
5/19 th May (Fri)	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG
5/20 th May (Sat)	Documentation	Documentation	Documentation
5/21 st May (Sun)	Documentation	Documentation	Documentation

5/22 nd May (Mon)	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG	Explanation and discussion of DOD to MLMUPC/GDCG
5/23 rd May (Tue)	Meeting with the Technical Cooperation Team Discussion with MLMUPC/ GDCG	Meeting with the Technical Cooperation Team Discussion with MLMUPC/ GDCG	Meeting with the Technical Cooperation Team Discussion with MLMUPC/ GDCG
5/24 th May (Wed)	Munities signing Report to Embassy of Japan Report to JICA Cambodia Office	Munities signing Report to Embassy of Japan Depart Phnom Penh Arrive Singapore Depart Singapore	Munities signing Report to Embassy of Japan Depart Phnom Penh Arrive Singapore Depart Singapore
5/25 th May (Thu)	(Mr. Kumagai) Depart Phnom Penh (Mr. Mizuguchi) Stay Phnom Penh	Arrive Narita	Arrive Narita
26 th May (Fri)	(Mr. Kumagai) Arrive Incheon Depart Incheon Arrive Narita		

Appendix 3 Name and position of members of the recipient country**(1) Ministry of Land Management, Urban Planning and Construction**

Mr. Sopha SUON	Director General, GDCG
Mr. Sophannara HE	Deputy Director General, GDCG
Mr. Vanna SO	Director, GDCG, Geography Department
Mr. Chharom CHIN	Deputy Director, GDCG, Geography Department

(2) Ministry of Water Resources and Meteorology

Mr. Oum Ryna	Director, Department of Meteorology
Mr. Khoeun Sokhom	Vice chief of Climate Research and Forecasting, Department of Meteorology

(3) JICA Cambodia Office

Ms. Atsuko KAMEI	Chief Representative
Mr. Takayuki SHIMODAIRA	Representative
Mr. Junetsu SHIMADA	Senior Administrative Officer
Mr. Kong Viseth	Program Officer

Appendix 4 Minutes of Discussion

Following Minutes of Discussion are attached in the next pages.

- (1) Minutes of Discussion on 4th October 2022
- (2) Minutes of Discussion on 24th May 2023

Minutes of Discussions
on the Preparatory Survey for the Project for
Establishment of Nationwide Continuously Operating Reference Station Network

Based on the several preliminary discussions between the Ministry of Land Management, Urban Planning and Construction (hereinafter referred to as “MLMUPC”) and Japan International Cooperation Agency Cambodia Office, Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as “the Team”) of the Project for Establishment of Nationwide Continuously Operating Reference Station Network (hereinafter referred to as “the Project”) to Cambodia. The Team held a series of discussions with the officials of the MLMUPC and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Phnom Penh October 4th, 2022

熊谷 英範

Mr. KUMAGAI Hidenori
 Leader
 Preparatory Survey Team
 Japan International Cooperation Agency
 Japan



H.E. Suon Sopha
 General Director
 General Department of Cadastre and Geography:
 Ministry of Land Management, Urban Planning and
 Construction
 Cambodia

ATTACHMENT**1. Objective of the Project**

The objective of the Project is to acceralate cadastral surveying, strengthening administrative services related to land registration by/through installation of continuously operating reference station, thereby contributing to promotion of infrastructure projects.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for Establishment of Nationwide Continuously Operating Reference Station Network”.

3. Project site

Both sides confirmed that the sites of the Project are in Cambodia, which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

- 4-1. The Ministry of Land Management, Urban Planning and Construction will be the executing agency for the Project (hereinafter referred to as “the Executing Agency”). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

5. Items requested by the Government of Cambodia

- 5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Cambodia are as follows:

Approximately 94 CORSs

- CORS Receiver with Antenna, structure to contain the equipment

CORS Data Center Expansion

- Servers and storage and other facilites such as UPS
- Software to be discussed to specify the terms and security (firewalls)

- 5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the



Project will be decided by the Government of Japan.

- 5-3. The Government of Cambodia shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in February, 2023.

6. Procedures and Basic Principles of Japanese Grant

- 6-1. The Cambodia side agreed that the procedures and basic principles and basic principles of Japanese Grant (hereinafter referred to as “the Grant”) as described in Annex 3 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Cambodia side to submit the Project Monitoring Report, the form of which is attached as Annex 4.

- 6-2. The Cambodia side agreed to take the necessary measures, as described in Annex 5, for smooth implementation of the Project. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

- 7-1. The Team will proceed with further survey in Cambodia until October 15th, however in case of item remained, the survey and discussion should be continued through remote operation.

- 7-2. An official request to the Government of Japan will be submitted before February, 2023.

- 7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Cambodia in order to explain its contents around February, 2023.

- 7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Cambodia side, JICA will finalize the Preparatory Survey Report and send it to Cambodia around June, 2023.

- 7-5. The above schedule is tentative and subject to change.

8. Environmental and Social Considerations

- 8-1. The Cambodia side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social

Considerations (April, 2010).

8-2. The Project is categorized as “C” from the following considerations:

Not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

9. Other Relevant Issues

9-1 Gender Mainstreaming

Both sides confirmed that following gender elements shall be duly reflected in the scope of Preparatory Survey.

- (a) Collection of information and gender disaggregated data for assessment of gender needs.
- (b) Examination of gender-responsive measures based on the assessment, such as:
 - ✓ Implementation of soft-component activities that promote women’s empowerment.

9-2 Number of CORS constructed

The number of CORS to be established will be determined based on budgetary and technical considerations, and it is not committed that all of the 94 items listed in the request will be maintained.

9-3 Architectural design of CORS

Both sides confirmed that the architectural design of CORS shall provide basic and united design for all CORS.

9-4 Technical standards applied for design of CORS

The technical standards for design of CORS shall apply the Japanese standard in principal by looking on the existing pilot project CORS.

9-5 Maintenance cost of CORS

The costs for maintenance and management of CORS shall be borne by the Cambodian side. The specific amount of such cost shall be re-confirmed in the DOD.

9-6 Temporary warehouse of the construction

Provision of the land for the temporary use for the construction shall be continuously discussed according to the method of the construction.

Annex 1 Project Site

Annex 2 Organization Chart

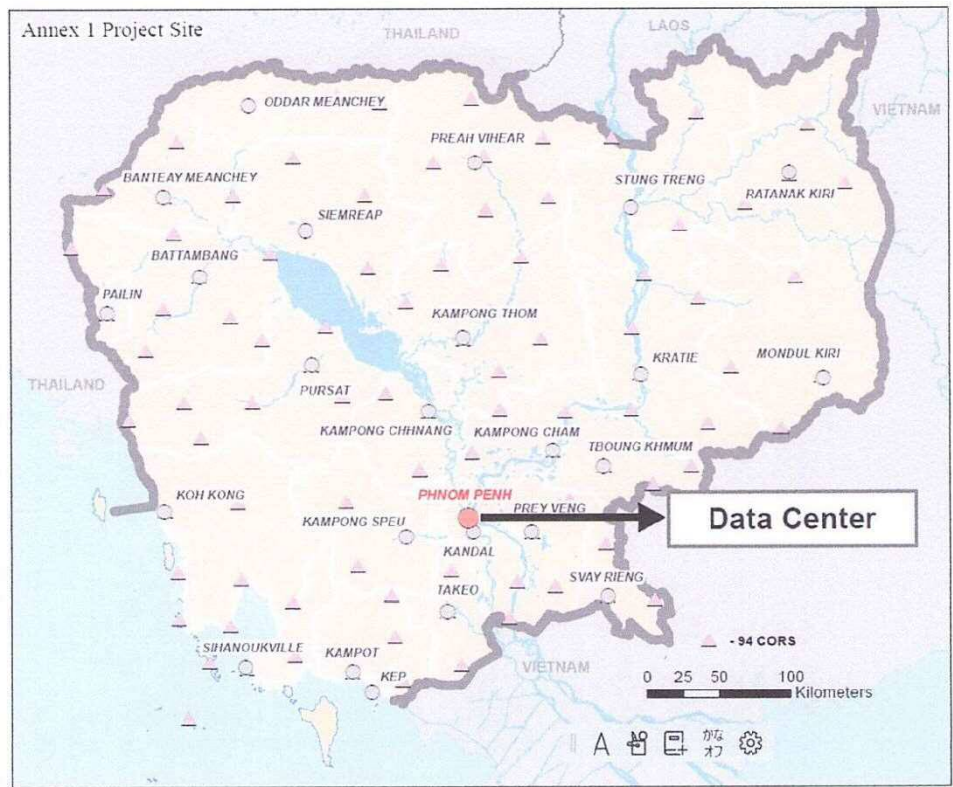
Annex 3 Japanese Grant

Annex 4 Project Monitoring Report (template)



Annex 5 Major Undertakings to be taken by the Government of Cambodia



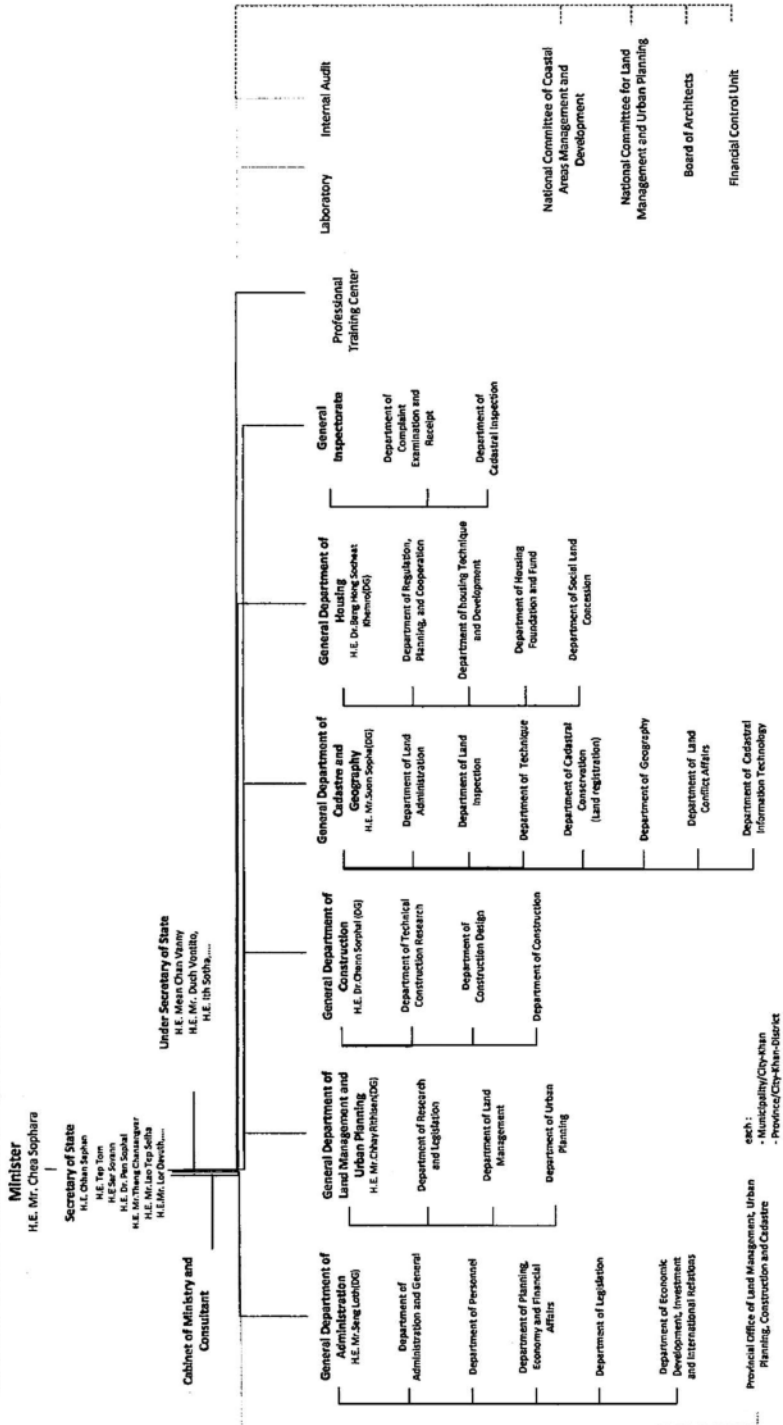


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Organization Structure of Ministry of Land Management, Urban Planning and Construction(MLMUPC)

ANNEX 2



D

2

JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as “the Recipient”) to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as “Project Grants”).

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See “PROCEDURES OF JAPANESE GRANT” for details):

- (1) Preparation
 - The Preparatory Survey (hereinafter referred to as “the Survey”) conducted by JICA
- (2) Appraisal
 - Appraisal by the government of Japan (hereinafter referred to as “GOJ”) and JICA, and Approval by the Japanese Cabinet
- (3) Implementation
 - Exchange of Notes
 - The Notes exchanged between the GOJ and the government of the Recipient
 - Grant Agreement (hereinafter referred to as “the G/A”)
 - Agreement concluded between JICA and the Recipient
 - Banking Arrangement (hereinafter referred to as “the B/A”)
 - Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as “the Bank”) to receive the grant
 - Construction works/procurement
 - Implementation of the project (hereinafter referred to as “the Project”) on the basis of the G/A
- (4) Ex-post Monitoring and Evaluation
 - Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of



relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

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2) Banking Arrangements (B/A) (See “Financial Flow of Japanese Grant (A/P Type)” for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the “Meeting”) will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the



Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.
- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Measures to ensure more efficient implementation of the Grant

- i) In the event that the E/N and the G/A concerning a project cannot be signed by the end of the following Japanese fiscal year of the cabinet decision concerned by the GOJ, the authorities concerned of the two Governments will discuss the cancellation of the project.

ii) In the event that the period, specified in the G/A, during which the grant is available expires before the completion of the disbursement, the authorities concerned of the GO J will thoroughly review the status, situation and perspective of the implementation of the project concerned before extending the said period. The authorities concerned of the two Governments will discuss the termination of the project including a refund, unless there are concrete prospects for its completion.

iii) Regardless of the period mentioned in ii) above, the authorities concerned of the two Governments will, in the event that five years have passed since the cabinet decision concerned by the GOJ before the completion of the disbursement, except as otherwise confirmed between them, discuss the termination of a project including a refund, unless there are concrete prospects for its completion.

4) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

5) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.



PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3) Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
4. Ex-post monitoring & evaluation	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

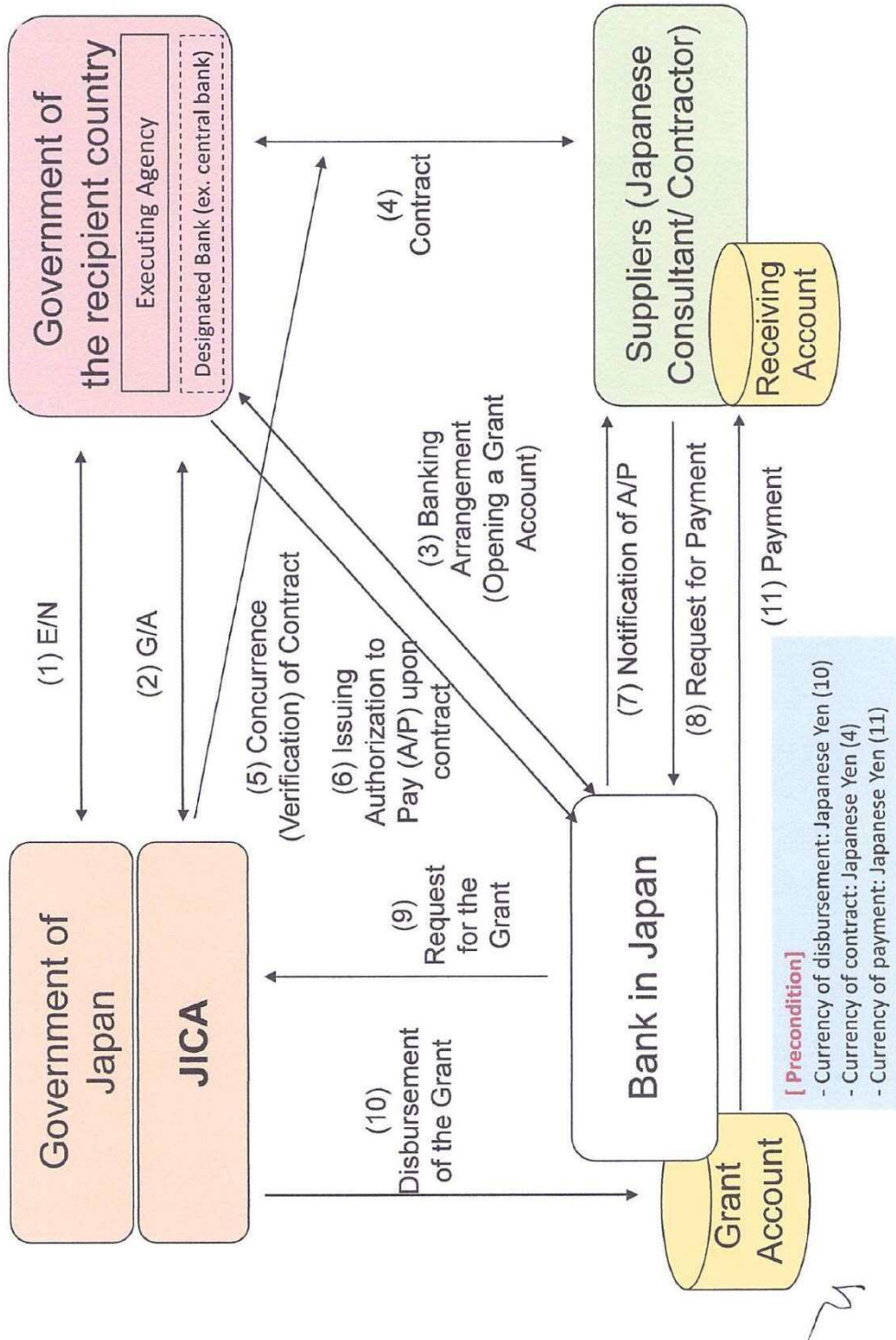
notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

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Financial Flow of Japanese Grant (A/P Type)



Annex 4
G/A NO. XXXXXXXX
PMR prepared on DD/MM/YY

<p><u>Project Monitoring Report</u> on <u>Project Name</u> <u>Grant Agreement No. XXXXXXXX</u> 20XX, Month</p>

Organizational Information

Signer of the G/A (Recipient)	<p>Person in Charge (Designation) _____</p> <p>Contacts Address: _____</p> <p> Phone/FAX: _____</p> <p> Email: _____</p>
Executing Agency	<p>Person in Charge (Designation) _____</p> <p>Contacts Address: _____</p> <p> Phone/FAX: _____</p> <p> Email: _____</p>
Line Ministry	<p>Person in Charge (Designation) _____</p> <p>Contacts Address: _____</p> <p> Phone/FAX: _____</p> <p> Email: _____</p>

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

G/A NO. XXXXXXXX
PMR prepared on DD/MM/YY

1: Project Description	
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1-1 Project Objective

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1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

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1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original (proposed in the outline design)	Actual
1.		

2-2 Scope of the work

Components	Original* (proposed in the outline design)	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

G/A NO. XXXXXXXX
PMR prepared on DD/MM/YY

2-3 Implementation Schedule

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	

Reasons for any changes of the schedule, and their effects on the project (if any)

--

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original ^{1),2)} <i>(proposed in the outline design)</i>	Actual
1.				
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original ^{1),2)} <i>(proposed in the outline design)</i>	Actual
1.				

G/A NO. XXXXXXXX
 PMR prepared on DD/MM/YY

Note: 1) Date of estimation:
 2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

<p>Original (at the time of outline design)</p> <p>name:</p> <p>role:</p> <p>financial situation:</p> <p>institutional and organizational arrangement (organogram):</p> <p>human resources (number and ability of staff):</p>
<p>Actual (PMR)</p>

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

<p>Original (at the time of outline design)</p>
<p>Actual (PMR)</p>

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

<p>Original (at the time of outline design)</p>
--

G/A NO. XXXXXXXX
 PMR prepared on DD/MM/YY

Actual (PMR)

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (at the time of outline design)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

G/A NO. XXXXXXXX
PMR prepared on DD/MM/YY

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

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5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

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5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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G/A NO. XXXXXXXX
PMR prepared on DD/MM/YY

Attachment

1. Project Location Map
 2. Specific obligations of the Recipient which will not be funded with the Grant
 3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
 - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/ Agreement and Schedule of Payment)
 5. Environmental Monitoring Form / Social Monitoring Form
 6. Monitoring sheet on price of specified materials (Quarterly)
 7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
 8. Pictures (by JPEG style by CD-R) (PMR (final) only)
 9. Equipment List (PMR (final) only)
 10. Drawing (PMR (final) only)
 11. Report on RD (After project)
 12. Report on the Management of Safety for Construction Works
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Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)		Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
Items of Specified Materials						Price (Decreased) E=C-D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●		●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials		1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1	Item 1	●	●	●			
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

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Report on the Management of Safety for Construction Works

Month/Year 2022 年 × 月	Cumulative number of labor 労働延人数	Cumulative number of public accident 公衆災害件数	Cumulative hours worked 延べ実労働時間数	Number of deaths and injuries due to industrial accidents 労働災害による死傷者	Death and injuries 死傷者数	Aggregated number of calendar days absent 延べ休業日数	Aggregated number of work-days lost 延べ労働損失日数	Frequency rate 度数率	Severity rate 強度率
This Month 当月				Death 死者 More than 4 calendar days absent 休業 4 日以上 1 to 3 calendar days absent 休業 1~3 日 Total 計					
Total including this month 当月迄累計				Death 死者 More than 4 calendar days absent 休業 4 日以上 1 to 3 calendar days absent 休業 1~3 日 Total 計					
<p>Note (注)</p> <p>1. Frequency rate is the frequency of occurrence of industrial accidents. 度数率 = (Number of deaths and injuries due to industrial accidents ÷ Cumulative hours worked) × 1,000,000 度数率 = (労働災害による死傷者数 ÷ 延べ実労働時間数) × 100 万時間</p> <p>2. Severity rate is degree of seriousness of the industrial accident. 強度率 = (延べ労働損失日数 ÷ 延べ実労働時間数) 1000 時間 強度率 = (延べ労働損失日数 ÷ 延べ実労働時間数) × (300 ÷ 365)</p> <p>3. Aggregated number of work-days lost = Aggregated number of calendar days absent × (300 ÷ 365) Death (7,500 days) : death as a result of an industrial accident includes not only instantaneous death but also death as a result of occupational injury or disease. 延べ労働損失日数 = 延べ休業日数 × (300 ÷ 365) . . . 死亡 7500 日 (即死のほか負傷が原因で死亡したものを含む)</p> <p>4. Frequency rate and severity rate are rounding off the third decimal place. 度数率・強度率は小数点第 3 位以下四捨五入</p>									

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Annex 5

Major Undertakings to be taken by the Government of Cambodia

1. Specific obligations of the Government of Cambodia which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	MEF		
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	MLMUPC		
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A		MLMUPC		
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
4	To secure and clear the following lands 1) project sites (5m × 5m=25m ² for each stations) 2) temporary construction yard and stock yard (4 locations, 50m×100m=5,000m ² for each)	before notice of the bidding documents	MLMUPC		
5	To obtain the planning, zoning, building permit	before notice of the bidding documents	MLMUPC		
6	To clear, level and reclaim the following sites 1) project sites (5m × 5m=25m ² for each stations) 2) temporary construction yard and stock yard (4 locations, 50m×100m=5,000m ² for each)	before notice of the bidding documents	MLMUPC		
7	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents	MLMUPC		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

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(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	MLMUPC		
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A		MLMUPC		
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	MLMUPC		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MLMUPC		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	MLMUPC		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MLMUPC		
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction	MLMUPC		
8	To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	within 1 month after completion of each work	MLMUPC		
	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)	MLMUPC		
9	To submit a report concerning completion of the Project	within 6 months after completion of the Project	MLMUPC		
10	To provide facilities for distribution of electricity and water supply and other incidental facilities necessary for the implementation of the Project outside the site(s)		MLMUPC		
	1) Electricity The distributing line to the each project sites , temporary construction yard and stock yard (4 locations)	before start of the construction			
	2) Water Supply The city water distribution to the temporary construction yard and stock yard (4 locations)	before start of the construction			

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure Routine check/Periodic inspection	After completion of the construction	MLMUPC		

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Minutes of Discussions
on the Preparatory Survey for the Project for
Establishment of Nationwide Continuously Operating Reference Station Network
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between the Ministry of Land Management, Urban Planning and Construction (hereinafter referred to as "MLMUPC") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on October 4th, 2022 and in response to the request from the Government of Cambodia (hereinafter referred to as "Cambodia") dated March 16th, 2023, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Establishment of Nationwide Continuously Operating Reference Station Network (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Phnom Penh, May 27th, 2023

KUMAGAI Hidenori

KUMAGAI Hidenori

Leader

Preparatory Survey Team

Japan International Cooperation Agency

Japan

H.E. Suon Sopha

H.E. Suon Sopha

Director General

General Department of Cadastre and Geography

Ministry of Land Management, Urban Planning and

Construction

Cambodia

ATTACHEMENT

1. Contents of the Draft Report

After the explanation of the contents of the Draft Preparatory Report by the Team, the Cambodia side comment the items to be considered in the detail design stage as given in Annex-1. JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Cambodia side around August, 2023.

2. Cost estimate

Both sides confirmed that the cost estimate explained by the Team is provisional and will be examined further by the Government of Japan for its approval.

3. Confidentiality of the cost estimate and technical specifications

Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded.

4. Timeline for the project implementation

The Team explained to the Cambodia side that the expected timeline for the project implementation is as attached in Annex 2.

5. Expected outcomes and indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Cambodia side will be responsible for the achievement of agreed key indicators targeted in year 2028 and shall monitor the progress for Ex-Post Evaluation based on those indicators.

[Quantitative indicators]

Indicator	Standard value (2023)	Target value (2028)
Number of CORS	5	99
Cover area of CORS	5,024 sqkm (approximately 2.8% of Land)	177,867 sqkm (approximately 98.1% of Land)
Number of Users	338	1,200

[Qualitative indicators]

The qualitative effects of the implementation of this project are as follows.

- a. The introduction of CORS is expected to reduce surveying time in cadastral surveying and increase the number of land transactions that can be handled. This will improve administrative services.
- b. The introduction of new surveying techniques such as networked RTK-GNSS (a method that enables a single surveyor to acquire position coordinates in a short time become able by obtaining a network CORS), surveying will speed up with accuracy and improve the efficiency of various surveying tasks in Cambodia.
- c. Improved efficiency in obtaining location coordinates will lead to digitization of the subsequent process of map creation, and the development of geospatial information will progress.
- d. The digitization of surveying and geospatial information will lead to increased productivity and promote the development of roads and other infrastructure because of the implementation of ICT construction at construction sites.
- e. Enables efforts to provide services that utilize location information using CORS, such as automated operation of agricultural machinery and drone deliveries to areas that are difficult to reach by land due to flooding.

6. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to six evaluation criteria (Relevance, Effectiveness, Coherence, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Cambodia side is required to provide necessary support for the data collection.

7. Technical assistance (“Soft Component” of the Project)

Considering the sustainable operation and maintenance of the products and services granted through the Project, following technical assistance is planned under the

Project. The Cambodia side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Preparatory Report.

- Maintenance of CORS
- Monitor of CORS
- Data Management

8. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 3. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in No.3, 4 and 5 of table (2) in Annex 2, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bid documents by MLMUPC during the design and implementation stage of the Project.

The Cambodia side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project which is described in Annex-3. It is further agreed that the costs are indicative, i.e. at Outline Design stage. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 3 will be used as an attachment of G/A.

9. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) that stipulated in the Annex 4 of Minutes of Discussions signed October 4th, 2022. The timing of submission of the PMR is described in Annex 2.

10. Project completion

Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the Grant are in operation. The completion of the Project will be reported to JICA promptly by the Executing Agency, but in any event not later than six months after completion of the Project.

11. Environmental and Social Considerations

11-1 General Issues

11-1-1 Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (January 2022)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as C because the Project is likely to have minimal adverse impact on the environment under the Guidelines.

12. Other Relevant Issues

12-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

12-2 Non-military use

The Cambodia side understood the principle of the Japan's Development Cooperation Charter, which stresses that ODA must not be utilized for military purpose or promoting international conflicts, and agreed to ensure that the data and equipment to be procured in the Project will never be used for any military purposes.

12-3 Budget adjustment of project implementation

Both sides confirmed when the project cost exceeds estimated amount, the CORS station numbers shall be reduced to adjust the budget. In that case, priority of CORS station will be selected by GDCG.

12-4 Gender Mainstreaming

Both sides confirmed that gender mainstreaming should be duly practiced for the Project implementation as the project is categorized as Gender Integrated Project. In particular, Both sides agreed on the following gender elements to be integrated into the Project.

(a) Women's participation in Maintenance of CORS

Annex 1 Items to be considered in the detail design stage

Annex-2 Project Implementation Schedule

Annex 3 Major Undertakings to be taken by the Government of Cambodia

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Annex-1: Items to be considered in the detail design stage

GDCG comment that following items should be considered in the detail design stage.

- a. The design of the top of the CORS structure should apply the one used in the technical cooperation project. The quotation including manufacturing and transport to the temporary yard of such concrete product shall be collected by GDCG to support the consultants.
- b. Fence around the foundation shall be established to prevent from damaging or stealing equipment of CORS. The quotation of such product shall be collected and provided to the consultants by GDCG.
- c. The location of CORS shall be reviewed and finalized by GDCG before the commencement of detailed design.
- d. The specification of the equipment provided in the Grant Aid shall be clarified in the detail design stage.
- e. GDCG mentioned that where the CORS are not covered by the existing lighting rod, such facility should be newly considered to be installed to protect the CORS.
- f. GDCG mentioned that the current quality and features of data management software of CORS under operation is desired to be continued. The detail of specification on the technical aspect such as accounting management feature, capable to process all type of satellite system will be discussed in the detail design stage.
- g. GDCG mentioned that the bidding should be made under the strong competition and without having to specify the brand of the management software.
- h. In case of new system introduced, total training, installation, and calibration of the system to maintain the current level of quality and feature shall be necessary. The specification of above shall be discussed in the detailed design stage.

JICA Study Team mentioned as follows:

- a. The training of the CORS management software is expected to be carried out by the suppliers. This shall be included in the bidding documents.

Annex-3:

Major Undertakings to be taken by the Government of Cambodia

1. Specific obligations of the Government of Cambodia which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost (USD)	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	MEF		
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	MLMUPC		
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A		MLMUPC		
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
4	To secure and clear the following lands 1) Project sites (5m × 5m=25m ² for each stations) 2) 4 Temporary yards	before notice of the bidding documents	MLMUPC		
5	To obtain the construction permit	before notice of the bidding documents	MLMUPC		
6	To clear and reclaim the following sites 1) project sites (5m × 5m=25m ² for each stations) 2) 4 Temporary yards	before notice of the bidding documents	MLMUPC		
7	To submit Project Monitoring Report (with the result of Detailed Design) with the Consultants support	before preparation of the bidding documents	MLMUPC		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost (USD)	Ref.
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	MLMUPC		
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A		MLMUPC		
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	MLMUPC		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MLMUPC		
5	To exempt the customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services subject to approval of the tax department.	during the Project	MLMUPC		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MLMUPC		
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction	MLMUPC		
8	To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training with support of Consultants	within 1 month after completion of each work	MLMUPC		
	To submit Project Monitoring Report (final) (including as-built drawings,	within 1 month after	MLMUPC		

	equipment list, photographs, etc.) with support of Consultants.	issuance of Certificate of Completion for the works under the contract(s)			
9	To submit a report concerning completion of the Project with support of Consultants.	within 6 months after completion of the Project	MLMUPC		
10	To provide power and water supply and other incidental facilities necessary for the implementation of the construction of CORS station.		MLMUPC		
	1) Electricity The distributing line to the each project sites. The power station shall be located within 50m from CORS.	before start of the construction			
	2) Water Supply The water availability to the each project site	before start of the construction			

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost (USD)	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Ensure the number of planned users 2) Contract with the service providers on repair and maintenance works	After handover of the construction	MLMUPC		

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MLMUPC

Attachment-5 Technical Note

TECHNICAL DISCUSSION**FOR THE PREPATORY SURVEY ON****The Project for Establishment of Network of Continuously Operating Reference Station
in Cambodia**

The Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Establishment of Network of Continuously Operating Reference Station in Cambodia (hereinafter referred to as "the Project") in consultation with the Government of Japan.

JICA sent to Cambodia the Preparatory Survey Team (hereinafter referred to as "the Team"), from 18th September to 15th October 2022. The Team Leader Mr. Hidenori KUMAGAI stayed in Phnom Penh from September 27th to October 4th, 2022 and held discussion with officials of the General Department of Cadastre and Geography, Ministry of Land Management, Urban Planning and Construction (hereinafter referred to as "MLMUPC"), and confirmed the main items as described in the Minutes of Discussion signed in 4th October, 2022.

The Team conducted further surveys in Cambodia and held various discussions with officials of MLMUPC. During the discussion, both parties have confirmed the necessity of the items shown in the Attached Document. The Team shall convey these items to JICA for the preparation of the Preparatory Survey Report.

Phnom Penh, 13th October 2022



H.E. Suon Sopha

General Director of GDCG

Ministry of Land Management
Urban Planning and Construction

Phnom Penh, Cambodia



Motoki OGAWA

Chief Consultant

Eight-Japan Engineering Consultant Inc.

Tokyo, Japan

Attachment

1. Organization

The organizational structure of the MLMUPC is as shown in Attachment 1 to the Minutes of Discussion signed on October 4, 2022, with 2436 number of officers (in 2021). The General Department of Cadastre and Geography (GDCG) is responsible for the operation and maintenance of CORS, with 182 number of officers.

2. Budget

The budgets of GDCG for the three-year period 2019-2021 are given in Table 2.1.

Table 2-1 Annual Budget of MLMUPC and GDCG

(Million USD)			
	FY2019	FY2020	FY2021
GDCG	1.43	1.43	0.90

Exchange rate: USD1 = KHR 4000

3. Evaluation of CORS locations

(1) Outline of the site survey

The GDCG team and a project team jointly conducted a field survey of 94 CORS at locations recommended by the GDCG. The GDCG team consisted of 6 teams while the project team consisted of 3 teams. The survey was conducted from September 24 to October 13 (18 days in total). The questionnaire applied in the study is shown in Table 3.1.

Table 3-1 Outline of the CORS Survey (Questionnaire)

CORS No.	
Coordinate (Original)	
Coordinate (Actual)	
Name of Facility/Landowner	
Address	
	Checklist
Overhead Visibility	(Take 360 degree Photo) Taken Yes/No: Photo ID Number: Any obstacles confirmed:
Signal Strength (GNSS)	(Confirm the sensitivity of GNSS by receiver meter)
Signal Strength (G3/G4)	(Check number of antennas shown on the phone) (Write used provider name)
Power line	(Nearest power line) Power provided (Yes/No)

	Distance from the planned spot: m Sketch if necessary:
Disaster	(Interview to supervisor of the facility /residents, especially water flooding)
Environment and social considerations	(Any building /house affected at place where CORS planned)
Soil Investigation	Visual observation
New development	Interview to residents /authorities
Access/Pavement	
Soil Type	

(2) Outline of the results

Of the 94 CORS listed in the request, SHV500KHM which is located in the island has been canceled by GDCG due to accessibility and difficulty to maintain. Newly MDK500KHM was introduced instead of SHV500KHM. Other two coordinates SHV400KHM and KKG400KHM which are located in the other islands shall be remained since according to the survey, it was confirmed that the areas are incorporated into the administrative structure with residents and ferry (transport) is operated in approx. every hour to access.

Others shall be evaluated and discussed based on the survey report for the suitability to establish CORS.

4. Structure of CORS

(1) Structure and Characteristics of constructed CORS in the JICA technical assistance

Cambodia's first CORS were installed in five locations in April 2022. Only the CORS at MLMUPC is set at a height of 6 m while the other four reference points are set at a height of 5 m

The CORS established in the JICA Technical Cooperation Project has the following characteristics

- It is a ground-mounted type, with RC structure on the superstructure and pile support on the foundation.
- The bottom plate is 2m x 2m, 50cm thick, and supported by 5 piles (RC square type 300).
- The standard height is 5m (6m only in front of the MLMUPC office building).
- Receivers and other equipment are separated in district buildings as standard (storage boxes are installed in the CORS for MLMUPC only).

(2) Comparison with the Japanese CORS

In Japan, CORS are constructed exclusively by the Geospatial Information Authority of Japan (GSI) and has the following standard characteristics.

- The standard slab dimensions are 3.0m x 3.0m with thickness of 1.0m.

- The foundation is supported by four piles. It is assumed that the slab thickness of 1 m was the structural thickness required to stabilize the accuracy of the received data in the long term. The number of piles is assumed to be four based on an engineering analysis of the required bearing capacity to support the overburden load.
- The structure is mainly made of stainless steel.
- Equipment is generally housed within the structure.
- The standard height is approximately 5 meters.

From the above, a comparison of the two is as follows.

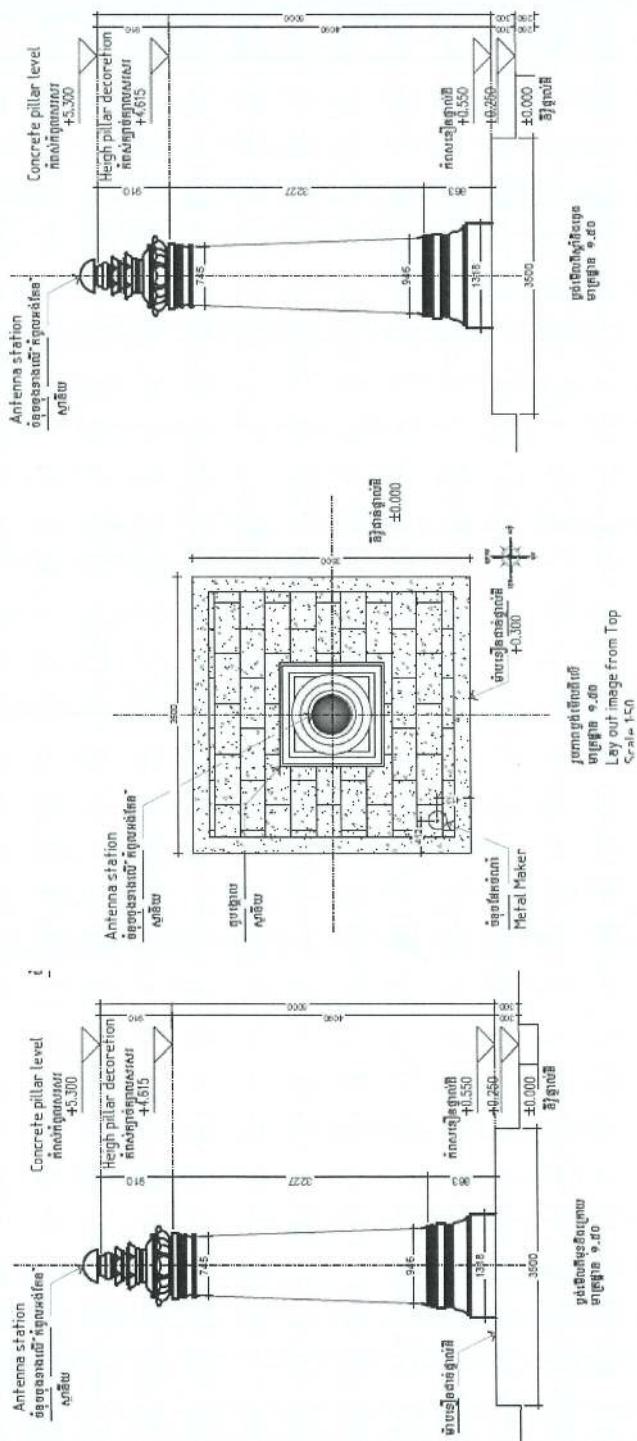
Table 4-1 Comparison between CORS of Japan and Cambodia

Item	Japan	Cambodia	Evaluation/Result
Superstructure	Stainless steel	Reinforced Concrete	Stainless steel will be an imported material and will be a burden to maintain, so RC is recommended as lesson obtained from the JICA technical cooperation project.
Foundation	3m×3m and 1m thickness 4 Piles	2m×2m and 0.5m thickness 5 plies	Based on Japanese experience, 2m x 2m x 1m / 4 (5) piles shall be applied.
Height	5m	5m	5m
Housing the equipment	Inside CORS	Outside CORS (At near buildings)	Outside CORS (At near buildings)

Based on the above, the recommended structure for this project is given in the next pages. However, following considerations shall be made in the design of CORS.

- Number of piles required shall be determined under the engineering analysis.
- The equipment is to be stored inside the building for security reasons, however some buildings may be more than 50 m apart from where CORS is to be constructed. In such cases, re-location of CORS is firstly recommended, however where this is difficult, storing the equipment inside the CORS shall be considered.
- Consider installing solar panels to supply power in areas where power is unstable.
- Take measures against lightning surges is crucial for such cases found in the JICA Technical Cooperation Project.

ស្ថិតិយកាត់រឹងអចិន្ត្រៃយ៍ជាមួយផ្ទះលាន



លេខ រៀង ភ្នំ	កំណែ	សហគ្រាស/មន្ទីរ/អង្គភាព	ឈ្មោះ	សម្រាប់	កម្រិត	ស្ថានភាព	សម្រាប់	ស្ថានភាព	សម្រាប់	ស្ថានភាព
01/09/02/2022	លេខ	លេខ	លេខ	លេខ	លេខ	លេខ	លេខ	លេខ	លេខ	លេខ

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(3) Verification of ground condition

Since no geotechnical investigation has been conducted in this preparatory survey, it is necessary to conduct this investigation at all 94 points during the detailed design stage to identify the depth of the supporting layer. Boring depth will be limited to confirming the supporting layer, and standard penetration tests and soil physical tests will be conducted in conjunction with the boring.

5. Expansion and maintenance of CORS and Data Center

(1) Required software - (Pivot enhancements, updates, licenses and others) for the Data Center

Pivot, introduced at JICA Technical Cooperation Project, is licensed for 100 users and up to 7 CORS. In addition, an Accounting Option and a Data Store Option have been installed. A license for a backup server has also been purchased.

The number of CORS to be covered and the number of users will increase with the introduction of 94 CORSs by the Japanese Grant, so the Pivot license will need to be extended as well. The following are the considered contents of the expansion.

- ✓ Support in case for the non-Trimble CORS receivers
- ✓ Maximum 200 CORS (for future expansion by the GDCG)
- ✓ Maximum 3000 users
- ✓ User management option for appropriate setting of usage fees
- ✓ Conversion option for users who want coordinate values in the old coordinate system

On the other hand, the equipment required for the data center is assumed to be as follows. A system configuration diagram is shown in Figure 5.1.

- ✓ 1 new server rack (cabinet)
- ✓ 1 Firewall
- ✓ 1 L3 Switch Hub
- ✓ 4 Servers (for CORS software, standby, data storage, and backup tapes)
- ✓ UPS (uninterruptible power supply) to cover all the above equipment



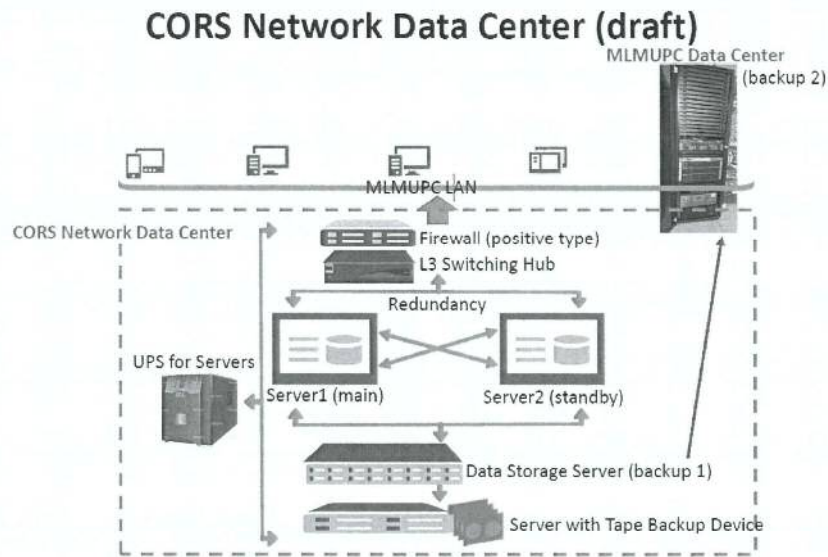


Figure 5.1 System Configuration Diagram

As some of the above equipment and software may be transferred to the JICA Technical Cooperation Project, continuous discussion of above subject shall be made with JICA.

(2) Maintenance of CORS

To maintain the CORS, it is recommended to make a 3-year maintenance agreement with a service provider such as the supplier of the equipment which covers the whole 99 CORS including the CORS established by the JICA Technical Cooperation Project. The service provider would repair the damaged parts under the Agreement. Also, the service provider would be possible to monitor the system in the Data Center for the GDCG officers periodically.

The key here is to respond to any problems with the GNSS receiver and GNSS antenna. According to the experience of the JICA Technical Cooperation Project, it took nearly one month to fix the damaged antenna by a supplier out of Cambodia, which was established to be damaged by a lightning surge, because of the supplier did not have a stock in Cambodia. During this time, another type of antenna procured for field experiment was used for this CORS. Note that the repair of such sophisticated device needs manufacturer's specialist outside the country.

One solution to this matter is to purchase and stock spare receivers and antennas in advance. In the event of an emergency, these should be replaced immediately as backup equipment, and any malfunctioning equipment should be repaired, even if it takes time, and stocked again as backup equipment after repairs are completed.

(3) Maintenance of Data Center

Making a 3-year maintenance agreement with the service provider is recommended as mentioned in the previous paragraph. The Agreement shall include technical support by phone, email, and online, and physical checks of the data center (server room) on a weekly or monthly basis. If there are any malfunctions, repairs, parts or equipment replacement will be performed.

(4) Cost for the maintenance

The cost need for the maintenance of CORS and the Data Center shall be 184,000 US\$ per year exclusive of extra receivers and antennas. Here, the number of these facilities to be stocked are estimated 5% of the total quantity from the experience of the JICA Technical Cooperation Project. This is approximately 20.44 % of GDCG's annual maintenance budget of \$0.90 Million of 2021. This amount cannot be said low compared to the budgeted amount for 2021, but as the number of users increases, the fees collected will also increase, and increasing number of users more than a thousand which predicted to be achieved within three years collects approx. 185,000 USD. This covers the maintenance costs without relying on the government budget. However, other items such as network, power and equipment replacement still expect on the governments expenditure and since this is the first ever payment item, it is considered to take a few years to be reflected stably in the new budget. Therefore, it is considered necessary for the project to bear 3 years of the maintenance agreement after hand over.

(Note: Unit price of Maintenance Agreement is tentative that was made under discussion and interview to related players, and might be changed according to the official quotation)

(5) Operational organization

Considering the current situation where the data center of the five CORS established in the JICA Technical Cooperation Project by the Geography Department, Technical Department and Department of Cadastral Information Technology, three to five technical members shall be assigned from GDCG.

The responsibilities of these technical members are listed below. The member in charge will be required to have knowledge of IT and equipment to be able to communicate with IT vendors and CORS vendors. Technology transfer and training in soft components will be conducted to support in this issue.

[Data Center]

- ✓ User Management
- ✓ Monitoring of incoming data from CORS
- ✓ Data backup (MLMUPC data center and magnetic tapes)
- ✓ Periodic operation check of data center equipment (to ensure that it is working and that there are no unusual noises or odors, etc.)
- ✓ Coordination with service providers in case of data center equipment failure

[CORS]

- ✓ Inspection of CORS by GCDG/provincial/district engineers (mainly to check energized

status and visual damage). When abnormalities are found, they are reported to the staff in charge of the data center.

- ✓ Periodic maintenance of the surrounding trees (e.g., pruning of overgrown trees) so that they do not obstruct the view of the sky.
- ✓ Reporting to data center staff when CORS equipment malfunctions (data center staff instructs service providers)

6. Construction Plan /Procurement

(1) Desirable business entity on construction

The project is to establish 94 CORS throughout Cambodia, and the following points should be taken into consideration to implement the construction.

- a Even though the volume of each works is small, sufficient construction management (especially process management) is required because the sites are spread over the entire land and the construction area is limited mainly by the administrative offices.
- b Knowledge and experience in IT equipment such as receivers and routers as well as the main body of the CORS are required.

Three compositions of bidding firms are assumed: construction company alone, construction company + trading company, and trading company alone. For each of these, the evaluation is based on examples from neighboring countries and similar work, as shown in Table 6.1.

Figure 6.1 Composition of Bidding companies

	Construction company alone	Construction company + trading company	Trading company alone
Construction of CORS	There is sufficient construction capability and little construction risk. However, in the case of a contractor with no experience in Cambodia, it may take time to procure a subcontractor or supplier.	The construction company can concentrate on construction and complement the construction company's unskilled areas such as procurement of materials and equipment and operation of equipment.	Since the trading company itself cannot do construction, it is expected that the work will be awarded to a local or third country contractor. In that case, it could be difficult for the consultant to manage the project.
Knowledge of	There may be no	The trading company	The company has

equipment	problems with construction and equipment procurement, but the company may not have sufficient experience in equipment installation and operation.	can supplement the construction company's unskilled areas.	sufficient product knowledge to advise the construction company on installation.
Evaluation	No problems with construction, but lack of knowledge in equipment operation [2]	A complementary relationship is established between the respective strengths of construction and equipment. [1]	Sufficient knowledge of equipment, but construction may not be adequately managed. [3]

Based on the above, in preparation of the bidding documents, the JICA Study Team recommended to set the qualification of the bidder for consortium of construction company and the trading company since capability on both the construction and IT technology will be required. Cambodia side made a comment that the contractor should be a single entity where other companies be sub-contracted by the prime contractor.

(2) Others

[Unit Price]

A construction unit cost was surveyed by interview to Japanese companies that have experience in projects in Cambodia and local companies affiliated with them. The survey will be brought back to Japan to report appropriate unit price setting to JICA for construction cost estimation.

[Defect Liability period]

The defect liability period of CORS and equipment shall be one year after handover.

7. Soft Component

The objective of the soft component in grant aid is to transfer technology necessary to ensure the functionality of the facilities provided, and in this project, it means to ensure the functionality of the established 94 CORS and data center.

Table 7.1 outlines the contents of the soft component. The soft component will primarily target data center officers and district engineers and will provide the necessary training in their respective roles. The results of the training will be documented in the form of manuals or guidelines. It is expected that the

technical document will be used by the GDCG to manage the operation of the CORS when it increases the number of CORS in the future.

Table 7.2 summarizes the roles and expected results of the three parties (GDCG, technical cooperation projects, and grant aid projects).

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Table 7-1 Contents of Soft Component

Delivery	Technical field	Activity		Target Group	Methodology	Implementation resources	Output
		Technical level					
		Current	Target				
1. Daily maintenance of CORS	Japanese Side	Equipment	–	–	Classroom lecture and field training, guideline development	Expert 1.0 MM	–
	Cambodian Side	Equipment	Little experience	Daily maintenance of CORS, Reporting and others	GDCG/Provincial Engineer	5 from data center, 2 from each Provinces and 94 from Districts by 1 day (Training) 3 data center officers by 5 days (guideline development)	CORS maintenance guideline daily operation
2. Periodic maintenance and repair works of CORS	Japanese Side	Equipment	–	–	–	Expert 1.0 MM	–
	Cambodian Side	Equipment	Identification of malfunctions and the need for repairs	Identification of cause and repair method, ordering and verification of repair work	Data Center Officers	5 data center officers by 2 days (training) 3 data center officers by 5 days (manual development)	CORS periodic and repair works guideline
3. Data management	Japanese Side	Positioning Technology	–	–	–	Expert 1.5 MM	–
	Cambodian Side	Positioning Technology	System built in the technical cooperation	Refer to Table 7.2	Data Center Officers	5 data center officers by 3 days (training) 3 data center officers by 10 days (Guideline development)	CORS operation guideline

Table 7-2 Role of players on Cambodia CORS

S/N	Type of Service	Technical Cooperation		Grant Aid		GDCG	Remarks
		Achievement	Further input	Consultants	Bidding Entity		
1	Construction of 94 CORS, procurement of IT equipment and software for the Data Center	Establishment of 5 CORS and Data Center		(Construction) 94 points selection, design, cost estimation, bid documents, construction management, PMR preparation support. (Training) Daily management and repair	CORS Construction, Equipment Procurement and Installation Expansion of PIVOT (CORS) (Maximum 200 points, 3000 users)	Responsibilities as a client of the project	
2	Transmission of observation data to data center (via cable Internet, 3G/4G line)	Introduction of PIVOT (MAX 7 CORS, 100 users)		(Training) Application Operation	Equipment operation/adjustment	Review of organization Secure budget	
3	Coordinates of CORS	Calculate the coordinate values considering 5 CORS networks	Technology Transfer for Calculation of Coordinate Values Considering CORS Network	Verification of GNSS / attached reference point coordinate values	Coordinates of GNSS Setting of attached reference point Site description	Authorize coordinate values for 94 points based on transferred technology	Request short-term experts as needed
4	Calculation of daily coordinates	Introduction of PIVOT Bernese (University of Bern) on one server		(Training) Application Operation	Equipment operation/adjustment		Consider expansion of Bernese license if needed
5	CORS Data Provision Service	Introduction of PIVOT		(Training) Application Operation	Equipment operation/adjustment		
6	Release of data on crustal deformation	N/A	N/A	N/A	N/A		
7	Provide real-time data	Introduction of PIVOT		(Training) Application Operation	Equipment operation/adjustment		
8	Providing observation data to IGS	Introduction of IGS	Advice on application on IGS	N/A	N/A	Application to IGS	
9	Provide network RTK correction data	Introduction of PIVOT		(Training) Application Operation	Equipment operation/adjustment		

10	Coordinate transformation service	Parameters calculated for 5 points	Technology transfer regarding parameter calculation methods	(Training) Application Operation	Equipment operation/adjustment	Authorize coordinate values for 94 points based on transferred technology	Request short-term specialists as needed
11	User registration	Introduction of PIVOT		(Training) Application Operation	Equipment operation/adjustment Function Building		
12	Fee collection service	Introduction of PIVOT		(Training) Application Operation	Equipment operation/adjustment Function Building		

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8. Utilization Plan

The nationwide rollout of CORS means that Cambodia will have the infrastructure in place for accurate positioning. In other words, it will be possible to quickly, accurately, and easily measure one's own location in digital form and handle the results with a machine (computer).

The first objective of the introduction of CORS through Japanese Grant Aid is to facilitate cadastral surveying to improve administrative services related to land registration, but at a seminar organized by the technical cooperation project on September 30, 2022 (Friday), the following precedents in Japan and Thailand were introduced regarding the utilization of CORS after its introduction.

If CORS is viewed as an infrastructure for providing location information managed at the national level, it will become a tool that opens up a variety of possibilities in the near future, depending on the creativity and ingenuity of the government, beyond the boundaries of the work under the jurisdiction of ministries and agencies.

In the seminar hosted by the JICA Technical Cooperation Project on 30th September 2022, following possibilities of using CORS were found. For this, it could be said the high potential of contribution on development of Cambodia was confirmed by introducing 94 CORS through the Japanese Grant Aid.

(1) Cadastral Survey

A method called network RTK survey which is the main objective of the introduction of CORS will provide rapid survey particularly at any location with an accuracy in "cm". For this, it is necessary to create and provide data called "correction information".

There is a great demand for surveying for development in Cambodia as well as for cadastral survey. It is said that there is a business custom for surveying equipment vendors to install private sector versions of CORS as a service in areas to be surveyed by the surveying companies. Accurate and rapid surveying is possible within a 20km radius around the CORS. The nationwide deployment of CORS is highly anticipated by surveying equipment vendors as it will lead to a reduction in their own installation costs.

(2) Control of construction / agriculture machines

A mobile unit equipped with a GNSS receiver can accurately and digitally determine its own position, enabling precise control of construction and agricultural equipment. At the seminar

of the technical transfer project, examples of ICT construction in Japan and a pilot project called "TIGORS" in Thailand were presented. In the TIGORS project, GNSS-controlled construction and agricultural equipment is being used in the process of road construction, slope shaping, grading, and paving, and in the process of preparing fields for rice cultivation and harvesting.

(3) Utilization of UAV (Unmanned Aerial Vehicles)

Expectations are high for the use of UAVs for logistics and delivery, facility inspection, pesticide spraying, disaster investigation, and other purposes, but the use of real-time accurate positioning information based on CORS is essential for their control. At the seminar, a case study of a logistics demonstration on a remote island in Japan was presented.

(4) Others

At the seminar, reference was made to the example of automated automobile driving as a Japanese case study, but this may be premature in Cambodia. Rather, the potential for use in resource management (e.g., understanding the boundary locations of forests and mined lands) and environmental management (e.g., monitoring the water cycle line by rainy and dry seasons, understanding the behavior of large wild animals such as elephants) may be more promising.

End

Appendix 6 Evaluation of CORS candidate sites

as of October 2022

No.	Province	ID	X	Y	Commune / District	Obstacles	Distance to power line (m)	Disaster History	Notes
1	BANTEAY MEANCHEY	BMC100KHM	280563	1503246	Ou Ambel / Serei Saophoan	low rise building, tree(s)	30	–	
2		BMC200KHM	238526	1509129	Phsar Kandal / Paoy Paet	–	30	–	
3		BMC300KHM	289414	1542224	Thmor Puok / Thmor Puok	low rise building	5	–	
4	BATTAMBANG	BTB100KHM	304659	1448519	Svay Pao / Battambang	–	40	–	
5		BTB200KHM	348565	1404469	Ruessei Krang / Moug Ruessei	school building	100	flooded to a height of 0.4m.	
6		BTB300KHM	287223	1478370	Boeng Pring / Thmor Koul	tree(s)	20	–	
7		BTB400KHM	326354	1419716	Kakaoh / Moug Ruessei	tree(s)	80	flooded to a height of 3m.	
8		BTB500KHM	267413	1396848	Ta Sanh / Samlout	low rise building, tree(s)	15	–	
9		BTB600KHM	215474	1468902	Ou Rumduol / Phnum Proek	tree(s)	50	–	
10		BTB700KHM	354359	1464484	Kaoh Chiveang / Aek Phnum				refused
11		BTB800KHM	279519	1425694	Sdao / Rotanak Mondol	low rise building, tree(s)	15	–	
12	KAMPONG CHAM	KCM100KHM	549996	1326275	Kampong Cham / Kampong Cham	tree(s)	80	–	
13		KCM200KHM	493688	1324785	Batheay / Batheay	low rise building, tree(s)	100	–	
14		KCM300KHM	558442	1354434	Preaek kak / Stueng Trang	tree(s)	150	–	
15	KAMPONG CHHNANG	KCH100KHM	463819	1354206	Kampong Chnang / Kampong Chnang	tree(s)	20	–	
16		KCH200KHM	457380	1313405	Tbaeng Khpos / Sameakki Meanchey	low rise building, tree(s)	23	–	
17		KCH300KHM	434077	1367482	Pech Changvar / Baribour	low rise building	30	–	
18	KAMPONG SPEU	<i>KSP100KHM</i>	<i>453157</i>	<i>1268472</i>	<i>Voar Sar / Samraong Tong</i>	–		–	JICA technical cooperation
19		KSP200KHM	414178	1246537	Traeng Trayueng / Phnum Sruoch	–	30	–	
20		KSP300KHM	405599	1305338	Sangkae Satob / Aoral	low rise building	60	–	
21	KAMPONG THOM	KTM100KHM	487913	1403987	kampong Roteh / Stueng Saen	tree(s)	160	–	
22		KTM200KHM	507027	1424342	Sambour / PrasaT Sambour	tree(s)	20	–	
23		KTM300KHM	528333	1461829	Dang kambet / Sandan	low rise building, tree(s)	20	–	
24		KTM400KHM	541628	1404700	Kraya / Santuk	–	230	–	
25		KTM500KHM	513290	1355476	Chrolong / Tang Kouk	middle rise building	30	–	
26		KTM600KHM	512703	1382732	Kampong Thmor / Santuk	lush trees blocking the sky	10	–	

27		KTM700KHM	448147	1430121	Msa Krang / Stoung	low rise building, tree(s)	38	–	
28		KTM800KHM	472975	1456671	Sa Kream / Stoung	–	18	–	
29	KAMPOT	KPT100KHM	409987	1172310	Andoung Khmer / Kampot	low rise building, tree(s)	50	flooded to a height of 0.15m.	
30		KPT200KHM	439853	1197439	Chhuk / Chhuk	low rise building, tree(s)	10	–	
31		KPT300KHM	445342	1166659	Angk Sophi / Kampong Trach	low rise building, tree(s)	50	–	
32	KANDAL	KDL100KHM	500855	1255544	Preaek Koy / S'ang	–		–	JICA technical cooperation
33		KDL200KHM	506326	1230208	Preaek Dach / Leuk Daek	low rise building, tree(s)	10	–	
34		KDL300KHM	512445	1296430	Chey Thum / Khsach Kandal	low rise building, tree(s)	30	–	
35		KDL400KHM	519451	1210718	K'am Samnar / Leuk Daek	low rise building, tree(s)	50	–	
36	KOH KONG	KKG100KHM	280243	1285575	Smach MeanChey / Khemarakphumint	middle rise building, tree(s)	5	–	
37		KKG200KHM	333166	1237192	Andoung Tuek / Botum Sakor	tree(s)	15	–	
38		KKG300KHM	331094	1291531	Ruessei Chrum / Thma bang	tree(s)	5	–	
39		KKG400KHM	289847	1210107	Koh Sdach / Kiri Sakor	tree(s)	15	–	
40		KKG500KHM	289384	1242158	Preaek Khsach / Kiri Sakor	–	350	–	
41		KKG600KHM	325944	1205352	Thma Sa / Botum Sakor	low rise building, tree(s)	100	–	
42	KRATIE	KRT100KHM	610659	1380546	Kratie / Kratie	power transmission line	60	–	
43		KRT200KHM	657761	1345912	Khsuem / Snuol	tree(s), power transmission line	15 ?	–	
44		KRT300KHM	604652	1355414	Chhloung / Chhloung	tree(s)	60	–	
45		KRT400KHM	605052	1412325	Sambour / Sambour	power transmission line	50	–	
46		KRT500KHM	650814	1433184	Roluos Mean Chey / Sambour	tree(s), school library	50	–	
47		KRT600KHM	614441	1448392	Our KanDier / Sambour	antenna tower for mobile phone (Cellcard), medium voltage utility pole, low rise building	40	–	
48	MONDUL KIRI	MDK100KHM	736796	1378968	Sok dom / Saen monourom	low rise building, tree(s)	20	–	
49		MDK200KHM	719092	1447427	Roya / Kaoh Nheak	low rise building, tree(s)	20	–	
50		MDK300KHM	708750	1342485	Srae Khtum / Kaev seima	tree(s)	40	–	
51		MDK400KHM	673910	1385137	Chng Phlah / Kaev Seima	–	40	–	
52		MDK500KHM	763414	1389021	Bousra / Pecrada	low rise building	30	–	
53	PHNOM PENH	PNH100KHM	486091	1285616				–	JICA technical cooperation
54	PREAH VIHEAR	PVR100KHM	497973	1526013	Pramer / Tbaeng MeanChey	low rise building	25	–	
55		PVR200KHM	503207	1494662	Rum Dos / Ro Vieng	–	25	–	
56		PVR300KHM	468155	1527669	Kuleaen Cheung / Ku Leaan	–	25	–	
57		PVR400KHM	493815	1571838	Choam Khsan Choam Khsan	–	40	–	

58		<u>PVR500KHM</u>	<u>543976</u>	<u>1544983</u>	<u>Chhaeb / Chhaeb</u>				refused
59		PVR600KHM	591616	1545174		low rise building, tree(s)	35	–	
60		PVR700KHM	547295	1502845	Kampong SralaoPir / Chhaeb	–	35	–	
61		PVR800KHM	547295	1502845	Chhmar / Chey Saen	tree(s)	30	–	
62	PREY VENG	PVG100KHM	535590	1269812	Kampong Leav / Prey Veng	tree(s)	30	–	
63		PVG200KHM	560938	1292679	Thma Pun / Kanhchriech	low rise building	150	–	
64		PVG300KHM	551361	1232123	Kampong Trabek / Kampong Trabek	low rise building	150	–	
65	PURSAT	PST100KHM	382620	1386931	Phateah Prey / Pursat	low rise building, tree(s)	15	flooded to a height of 0.8m.	
66		PST200KHM	403795	1365223	Svay Sar / Krakor	tree(s)	15	flooded to a height of 2.5m.	
67		PST300KHM	341511	1360844	Samrong / Talor Saenchey	low rise building	30	–	
68		PST400KHM	293948	1361054	Bramoy / Veal Veng	tree(s)	10	–	
69		PST500KHM	255008	1348406	Thmrda / Veal Veng	in a wood	250	–	
70		PST600KHM	305642	1336026	Or Saom / Veal Veng	tree(s)	60	–	
71		PST700KHM	392278	1412966	Reang Til / Kandieng	water surface	1000	water depth of 8m	
72	ROTANA KIRI	RNK100KHM	715035	1518680	Laban Siek / Ban Lung				no data
73		RNK200KHM	753735	1512523	Lum Choar / Ou ya Dav	–	40	–	
74		RNK300KHM	727780	1554056	Ta Veang Kraom / Ta Veang	–	40	–	
75		RNK400KHM	684082	1498529	Trapeang Kraham / Koun Mom	–	70	–	
76	SIEMREAP	SRP100KHM	380263	1478967	Slogram / Siem Reap			–	JICA technical cooperation
77		SRP200KHM	328457	1504314	Kampong Thkov / Kraleanh	low rise building, tree(s)	60	flooded to a height of 0.5m.	
78		SRP300KHM	370153	1531430	Brasaeat / Vearin	low rise building, tree(s)	120	flooded to a height of 5m.	
79		SRP400KHM	419736	1504104	Ta Siam / Svay leu	low rise building, tree(s)	60	–	
80		SRP500KHM	422131	1454354	Kok Thlok Krom / Chi Kreng	low rise building, tree(s)	30	–	
81	SIHANOUK VILLE	SHV100KHM	337043	1174958	Sangkeat bei / Sihanoukville	low rise building, tree(s)	80	–	
82		SHV200KHM	370498	1183977	Vealrenh / Prey Nob	low rise building, tree(s)	20	flooded to a height of 0.1m.	
83		SHV300KHM	368960	1221512	Chamkar Luong / Kampong Seila	low rise building, tree(s)	30	–	
84		SHV400KHM	310983	1179580	Koh Rong Samloem / Koh Rong	low rise building, tree(s)	100	–	
85		SHV500KHM	295934	1139520	Koh Tang / Koh Rong				Remote Island
86		SHV600KHM	367299	1165144	Ochrov / Prey Nob	tree(s)	50	–	
87	STUNG TRENG	STG100KHM	605241	1494919	Stung Treng / Stung Treng			–	JICA technical cooperation

88		STG200KHM	638374	1483811	Kbalormas / Sesan	–	30	–	
89	SIHANOUK VILLE	STG300KHM	650482	1562100	Thmakev / Siem Pang	–	50	–	
90	SVAY RIENG	SVR100KHM	587850	1225944	Prey Chhlak / Svay Rieng	tree(s)	50	–	
91		SVR200KHM	620310	1223111	Chrakamtes / Bavet	in a wood	20	–	
92		SVR300KHM	586511	1261771	Kampong Trach / Rmeasahek	–	40	–	
93	TAKEO	TKE100KHM	476695	1215076	RokarKhnung / DoukKeo	low rise building	100	–	
94		TKE200KHM	479422	1242864	ChamBak / Bati	tree(s)	150	–	
95		TKE300KHM	485911	1177305	Preahbat Choamchum / KiriVong	–	40	–	
96	STUNG TRENG	TKE400KHM	437779	1226322	Trapeang Kranhoung / TramKak	low rise building, tree(s)	50	flooded to a height of 0.2m.	
97	OTDAR MEANCHE Y	OMC100KHM	339578	1569228	Samrong / Samrong	tree(s)	20	flooded to a height of 0.3m.	
98	SIHANOUK VILLE	OMC200KHM	401050	1573533	Anlong Veng / Anlong Veng	low rise building, tree(s)	20	–	
99		OMC300KHM	430518	1569769	Tomnbdach / Trapeang Prasat	low rise building, tree(s)	100	–	
100	PAILIN	PLN100KHM	240658	1422374	Samrong / Pailin	low rise building, tree(s)	65	–	
101	TBOUNG KHMUM	TKM100KHM	585600	1315405	Sralb / Suong	low rise building, tree(s)	50	–	
102		TKM200KHM	645914	1315463	Tonlong / Memot	tree(s)	20	–	
103		TKM300KHM	619542	1303726	Dar / Memot	low rise building, tree(s)	10	–	

Attachment 7 Daily Rainfall Data

Following data shall be attached in the next pages.

- Phnom Penh daily rainfall data (mm/day) (2000~2019)
- Siemreap daily rainfall data (mm/day) (2000~2019)
- Stung Treng daily rainfall data (mm/day) (2000~2019)

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
1月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	2.6	--	--	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
5	0.0	21.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
6	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	--	--	0.0	--	--	--	
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	0.6	0.0	--	--	--	
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
11	25.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	7.2	0.0	--	--	--	
12	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	0.2	--	
13	0.0	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	2.8	0.0	--	--	--	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	--	4.8	0.0	--	--	--	
17	0.0	0.6	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	--	--	0.0	0.5	--	--	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
19	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	1.2	0.0	0.0	0.0	--	--	0.0	--	--	--	
20	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8	0.0	0.0	0.0	0.0	0.0	--	--	6.4	--	--	--	
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
23	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	--	--	1.0	--	--	--	
24	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	18.8	--	--	--	
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.6	0.0	0.0	0.0	8.0	0.0	0.0	0.0	--	--	0.8	0.0	--	--	
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.6	--	--	--	
28	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	--	--	34.2	--	--	--	
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	--	--	22.8	--	--	--	
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.0	0.0	0.0	--	--	0.0	--	1.0	--	
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
Total	56.5	74.4	0.0	0.0	0.4	0.0	0.1	0.0	74.1	0.0	25.4	0.8	27.0	0.0	0.0	2.6	0.0	16.2	83.8	3.1	1.2	0.0	16.6
N	2.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.5	

Phnom Penh Daily Rainfall -1

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
2月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	6.6	0.0	--	--	--	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	--	--	0.0	--	--	--	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	63.4	
9	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	0.3	
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	0.2	
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
14	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.8	0.0	0.0	0.0	--	--	0.0	--	--	--	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
19	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	0.0	6.1	0.0	--	--	0.0	--	--	--	
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
22	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	3.9	--	--	--	
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
25	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	0.4	0.0	--	--	--	
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
28	5.1	0.0	0.0	0.0	0.0	0.0	41.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	0.0	--	--	--	
29	5.1																--	--		--	--	--	
Total	13.4	0.0	0.0	0.0	0.0	0.0	42.1	0.0	0.6	14.6	0.0	0.0	41.0	0.0	6.1	0.0	0.4	6.6	3.9	0.0	0.0	63.9	8.8
N	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.2

Phnom Penh Daily Rainfall -2

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
3月1日	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0.0	0.0	19.5	0.0	0.0	0.0	19.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	-	-	0.0	-	-	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-	-	0.0	-	-	-	
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	
7	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	87.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	
8	9.0	7.8	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	
9	0.0	3.6	0.0	0.0	0.0	0.0	2.0	0.0	0.6	7.6	0.0	1.2	0.6	0.0	0.0	-	-	0.0	-	-	-		
10	0.0	29.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	-	-	0.0	-	-	-		
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
12	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
13	0.0	0.0	0.0	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
14	22.2	3.2	12.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
15	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	-	-	0.0	-	-	-		
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	14.8	1.8	-	-	
17	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
18	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
19	0.0	19.2	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
20	0.0	28.4	0.0	0.0	0.0	0.0	11.3	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	-	-	0.0	-	-	-		
21	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.2	1.4	0.0	13.8	0.0	-	-	2.6	0.0	-	-	2.0	
22	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	-	-	49.4	-	-	-		
23	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	8.6	19.8	0.0	0.0	0.0	-	-	0.0	-	-	-		
24	0.0	4.8	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	6.4	-	-		
25	0.0	59.2	0.0	2.4	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0	0.0	1.4	-	-	1.8	0.0	10.8	-		
26	3.3	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	15.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	-	-	0.0	-	-	-		
28	16.2	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-		
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	5.8	0.0	-	-		
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	-	-	5.0	0.0	-	-		
31	0.0	0.0	0.0	40.8	0.0	0.0	1.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	-	-	2.2	-	-	-		
Total	52.0	171.0	32.8	46.6	0.0	0.0	33.8	32.7	112.0	7.1	35.6	11.4	28.8	1.8	13.8	2.9	0.0	15.2	51.6	32.0	1.8	2.0	31.1
N	2.0	5.0	2.0	1.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	1.0

Phnom Penh Daily Rainfall -3

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
4月1日	0.0	0.0	1.0	0.0	0.0	0.0	0.8	0.0	2.8	54.3	0.0	0.0	0.0	0.0	0.0	-	-	82.0	0.0	13.2	-	-	
2	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.1	0.0	0.0	0.0	-	-	0.0	-	-	-	31.8	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.6	2.0	9.4	0.0	20.7	0.0	0.0	-	-	10.6	0.0	-	-	0.6	
4	0.0	0.0	0.0	0.0	0.0	57.6	0.0	0.0	0.0	0.0	0.0	0.0	14.9	71.5	0.0	-	-	4.3	0.0	-	-	0.2	
5	33.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	0.0	0.0	0.0	0.0	9.2	-	-	28.8	0.0	-	-	-	
6	0.0	0.0	0.0	0.0	0.0	23.1	0.0	4.4	1.3	0.0	0.5	0.0	0.0	33.6	2.8	2.2	-	-	-	-	-	-	
7	0.0	0.0	23.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0*	-	-	0.0	-	-	2.2	3.4	-	-	-	
8	0.0	0.0	0.4	1.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	17.5	0.0	0.0	-	-	0.0	-	-	2.6	-	
9	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	-	-	0.0	-	-	3.0	3.5	
10	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.6	0.0	0.0	-	-	0.0	-	-	-	19.9	
11	6.0	0.0	0.0	0.0	9.5	0.0	0.0	2.4	0.0	0.3	0.0	0.3	2.3	33.4	10.2	-	-	0.0	-	-	-	0.2	
12	12.5	0.0	0.0	0.0	0.0	0.0	11.4	0.2	0.0	0.0	0.0	0.0	7.8	0.0*	-	-	-	0.0	-	-	15.0	-	
13	7.9	0.0	0.0	0.0	78.4	0.0	18.6	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	-	-	6.8	0.0	-	3.2	1.0	
14	0.0	0.5	18.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	4.8	0.0	-	-	0.0	-	-	-	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	3.4	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
16	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	3.5	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	6.7	9.2	0.0	-	-	7.3	-	-	-	
18	45.8	0.0	0.0	0.0	0.0	0.0	0.0	1.0	27.2	0.0	70.8	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
19	0.8	9.4	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	21.5	-	-	12.8	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	34.6	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	0.0	0.0	17.2	0.8	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
22	50.3	0.0	0.0	0.0	0.0	0.4	0.0	10.7	0.0	0.0	0.3	14.0	1.5	18.2	-	-	-	0.0	-	-	-	29.4	
23	0.0	0.0	0.0	0.5	0.0	16.2	0.0	27.6	0.0	80.0	0.2	0.6	0.0	0.8	-	-	-	0.0	-	-	0.8	24.0	
24	10.5	0.0	16.2	0.0	0.0	0.3	0.0	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
25	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-	-	65.4	12.0	-	46.6	-	
26	0.0	0.0	0.0	4.7	0.0	0.0	0.1	0.7	46.4	0.0	0.0	5.0	0.0	0.0	20.6	-	-	1.2	-	-	2.2	-	
27	0.0	34.3	0.0	0.0	0.0	0.0	33.0	0.0	1.0	0.0	0.0	0.0	2.2	0.0	40.8	-	-	10.8	-	-	-	56.0	
28	0.0	0.0	0.0	1.3	6.4	13.5	2.4	1.4	1.8	0.0	0.0	9.8	48.5	4.9	0.0	0.8	47.0	1.0	39.2	-	-	-	
29	2.7	7.6	2.4	0.0	0.0	1.6	1.8	21.2	0.0	4.4	0.0	0.0	11.0	0.0	-	-	3.8	-	-	-	0.5	-	
30	0.0	0.0	1.6	3.1	0.0	0.0	0.0	24.7	0.0	0.0	20.0	0.0	0.0	0.5	1.8	-	-	38.4	-	-	-	-	
Total	190.8	55.0	64.1	10.1	94.8	73.7	65.4	39.9	83.4	270.5	55.9	130.9	77.8	134.2	147.1	124.5	2.6	249.9	80.1	73.9	73.4	179.9	103.5
N	6.0	1.0	3.0	0.0	1.0	2.0	3.0	1.0	3.0	9.0	1.0	2.0	3.0	5.0	3.0	5.0	0.0	5.0	3.0	3.0	2.0	6.0	3.0

Phnom Penh Daily Rainfall -4

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average	
5月1日	0.0	0.0	10.2	3.4	19.0	0.0	10.2	8.4	8.8	50.4	0.4	0.0	0.0	1.8	0.0	0.2	-	2.4	15.2	-	-	-	-	
2	0.0	0.0	8.0	0.0	0.0	0.0	8.0	0.0	28.4	3.1	0.0	3.8	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	
3	0.0	5.0	0.0	0.0	2.6	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.2	10.2	7.7	-	-	2.2	-	-	-	6.8	
4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	32.2	0.0	0.0	0.0	9.2	0.0	0.0	0.0	0.0	-	-	46.6	18.5	-	-	-	
5	2.4	0.0	0.0	33.0	0.4	0.0	0.0	0.0	1.0	3.5	5.3	0.0	27.0	0.0	0.0	0.0	0.5	-	0.0	-	-	-	11.3	
6	0.0	0.0	13.4	0.0	0.0	0.0	13.4	2.0	0.8	0.5	0.0	2.2	0.0	0.0	6.9	0.0	-	-	47.5	40.0	-	-	16.6	
7	0.0	0.0	0.0	0.0	85.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	7.9	23.6	0.0	0.0	-	-	0.0	7.8	-	-	-	
8	0.0	0.0	0.0	0.0	0.0	1.8	0.0	4.5	10.8	0.0	0.0	0.0	61.4	0.0	0.0	0.6	-	-	12.0	40.0	-	-	-	
9	0.0	5.2	0.0	0.0	5.6	17.6	0.0	3.3	0.6	0.0	0.0	0.0	7.6	5.6	0.0	0.0	-	-	2.6	0.0	17.0	-	-	
10	47.0	0.2	0.0	26.0	3.0	0.0	0.0	18.3	1.0	3.8	0.0	0.2	0.0	0.0	0.0	0.0	-	-	57.2	0.0	0.4	-	-	
11	5.6	4.4	0.0	3.6	0.0	0.0	0.0	15.0	1.8	4.2	0.0	0.0	0.0	0.0	0.9	0.0	0.0	-	0.6	0.0	7.0	-	-	
12	36.7	23.0	0.0	6.5	0.0	0.8	0.0	9.5	7.8	1.0	0.0	0.5	0.2	2.0	0.0	2.0	2.4	-	0.0	-	-	48.8	-	
13	0.8	2.0	0.0	54.3	0.0	0.0	0.0	5.0	25.4	33.8	0.0	1.8	5.6	0.0	4.1	3.8	-	-	2.6	1.5	5.6	-	-	
14	0.3	0.0	0.7	3.4	0.0	0.0	0.7	0.5	1.6	7.0	0.0	5.4	18.0	0.0	0.0	0.0	1.0	1.4	0.0	-	-	-	-	
15	1.6	2.2	0.7	0.0	0.0	0.0	0.7	1.6	6.2	15.4	0.0	14.4	29.2	13.6	0.0	0.0	0.8	-	0.0	-	-	-	1.7	
16	0.0	12.9	0.0	0.8	0.0	4.4	0.0	0.0	77.8	41.9	0.0	0.6	0.0	0.0	0.0	0.0	-	-	12.6	3.8	6.8	-	-	
17	5.1	1.2	0.3	0.0	0.5	0.0	0.3	0.0	8.0	6.2	0.0	0.0	8.2	0.0	0.3	0.0	2.0	2.8	64.8	-	-	-	42.5	
18	0.0	1.8	9.2	1.6	0.0	0.0	0.0	9.2	0.0	0.0	0.0	9.0	0.0	4.8	0.0	0.0	13.0	2.2	3.0	-	-	-	14.3	
19	0.0	4.4	3.2	1.0	0.0	0.1	3.2	0.0	0.0	0.0	0.0	0.9	0.0	12.6	0.0	0.0	-	-	11.0	1.9	-	14.0	2.6	
20	38.3	5.4	10.0	0.0	0.0	2.7	10.0	0.0	0.0	3.3	0.0	7.0	0.0	0.0	0.0	0.0	10.4	8.8	58.6	-	-	-	2.5	
21	1.9	0.2	3.6	2.4	0.0	8.4	3.6	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	-	-	4.6	8.4	23.6	-	-	
22	1.9	0.0	0.0	0.2	0.0	24.7	0.0	0.0	2.2	0.0	0.0	35.4	0.0	0.0	20.8	0.0	-	-	4.4	1.2	25.6	4.2	-	
23	3.6	0.0	0.6	3.4	0.0	0.0	0.6	10.6	0.0	0.4	0.5	4.6	0.0	24.8	2.0	0.0	-	-	1.2	0.0	-	-	67.0	
24	24.2	0.0	0.0	1.5	0.0	0.2	0.2	0.0	4.5	6.5	0.2	0.0	0.0	1.6	0.0	0.0	0.4	16.6	20.0	13.0	0.8	3.5	-	
25	2.4	2.4	1.4	0.0	0.0	0.0	1.4	0.0	0.0	3.0	0.0	13.7	0.0	0.0	0.0	1.4	4.2	-	0.0	0.7	-	-	-	
26	13.6	3.0	0.2	0.4	0.0	8.0	0.2	37.4	0.0	35.0	0.0	3.9	1.2	1.8	0.0	3.8	-	-	10.0	1.4	-	-	0.5	
27	0.0	1.4	0.0	0.0	0.0	1.2	0.0	4.7	0.0	5.4	11.5	0.6	0.0	1.3	0.0	0.8	0.4	-	0.0	-	-	-	15.5	
28	0.0	0.0	0.0	0.0	0.0	1.7	0.0	8.4	0.0	12.7	0.0	2.0	2.3	0.0	0.0	12.8	0.3	20.8	0.0	7.2	-	-	-	
29	0.0	18.6	0.0	0.0	0.0	0.2	0.0	0.2	1.0	0.0	23.0	16.0	0.0	0.0	0.2	-	-	-	1.1	4.4	-	-	-	
30	6.8	1.8	20.2	0.0	8.0	1.5	20.2	26.6	0.0	1.8	0.0	1.6	1.2	3.0	0.0	0.0	-	-	8.0	13.3	-	-	2.2	0.7
31	14.0	9.6	0.0	5.6	36.5	0.2	2.1	2.3	0.6	0.0	0.0	0.6	0.0	0.4	0.5	0.6	0.2	0.6	2.0	-	-	10.8	6.6	
Total	206.2	104.7	81.7	148.1	160.6	73.5	84.0	192.4	197.3	241.7	26.9	131.4	185.8	98.0	44.8	33.9	35.6	230.1	307.7	154.7	81.3	191.6	136.9	
N	6.0	3.0	4.0	3.0	3.0	2.0	4.0	6.0	4.0	4.0	6.0	4.0	5.0	4.0	2.0	1.0	2.0	8.0	8.0	5.0	3.0	6.0	4.1	

Phnom Penh Daily Rainfall -5

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
6月1日	1.1	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	7.0	0.0	18.6	0.0	5.2	-	0.8	-	-	49.8	-
2	3.2	0.0	0.0	2.0	70.0	1.8	0.0	77.8	9.2	0.0	2.6	0.0	0.0	0.0	2.0	2.8	-	-	0.1	0.2	-	-	-
3	30.6	6.2	0.0	0.0	2.6	0.0	0.0	0.0	2.7	30.0	0.9	0.0	0.5	0.4	0.0	0.0	-	-	12.0	0.0	16.0	23.6	49.0
4	0.0	0.0	7.5	63.0	0.0	0.0	0.2	0.0	4.0	7.0	0.0	3.0	0.0	5.0	7.8	0.0	-	-	0.0	17.1	-	-	-
5	0.0	3.0	10.0	0.0	6.2	5.3	8.8	0.0	0.0	3.0	12.0	15.0	14.2	2.4	0.0	0.0	4.2	-	0.0	-	-	-	-
6	30.0	39.2	0.0	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	10.0	52.6	0.0	0.0	6.4	-	3.4	11.2	1.1	-	-
7	19.2	1.4	0.5	0.0	5.8	0.0	8.0	14.8	0.0	0.0	0.4	31.8	26.0	0.0	0.0	0.0	0.3	-	0.0	3.6	-	-	-
8	3.6	6.8	1.0	0.0	31.8	2.2	0.0	0.0	34.6	0.0	47.5	0.0	3.7	0.0	0.0	0.0	38.6	3.6	0.4	5.6	-	-	1.4
9	6.7	0.0	0.0	0.7	2.4	5.6	0.0	2.1	0.3	17.1	0.2	0.3	0.0	29.3	0.0	-	-	-	0.0	11.0	-	-	0.2
10	4.6	12.6	28.7	0.0	0.0	0.0	7.6	0.0	26.6	0.0	7.0	0.0	0.0	0.0	0.0	0.0	-	-	23.6	1.0	1.7	7.5	-
11	0.0	0.4	0.0	0.0	24.1	0.0	0.0	0.0	53.0	0.4	0.0	0.2	0.0	0.0	5.8	0.0	-	-	0.6	-	-	-	27.2
12	0.0	1.8	0.0	13.6	3.2	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	-	0.0	-	-	-	-
13	0.0	3.2	0.0	0.4	1.2	0.2	0.0	0.0	0.4	0.0	2.4	27.8	0.0	1.9	5.0	4.5	1.4	-	1.4	-	-	6.4	-
14	0.0	6.0	30.0	20.5	3.4	0.0	0.6	47.0	2.6	0.5	4.4	3.3	0.0	14.6	0.6	-	-	0.3	0.0	9.5	1.4	7.7	-
15	1.4	0.0	42.5	6.0	1.3	0.0	0.0	0.0	7.2	2.2	1.2	3.0	0.0	21.6	17.8	4.9	15.0	0.6	6.6	-	-	0.4	-
16	3.5	1.2	0.0	0.0	6.6	0.0	0.3	28.2	0.2	32.2	0.0	0.0	0.0	29.7	0.0	40.3	50.0	-	0.0	-	-	-	-
17	27.4	4.2	0.0	0.0	4.2	0.0	23.2	0.0	2.8	1.1	0.0	0.0	0.0	16.3	7.2	5.2	7.0	0.5	1.3	-	-	17.0	5.6
18	4.2	0.0	0.0	0.6	0.0	0.8	21.4	0.0	0.0	0.0	0.0	24.6	0.0	10.6	11.6	0.0	-	-	10.9	-	-	-	-
19	0.0	0.0	0.0	0.6	0.4	10.7	0.0	7.9	4.1	7.3	31.2	0.0	0.0	0.6	0.3	25.5	38.6	-	23.0	1.6	3.5	28.3	-
20	0.0	0.8	3.5	0.0	0.0	5.8	13.2	10.7	42.2	0.0	2.8	0.0	0.0	2.3	1.2	1.4	33.0	-	0.0	-	-	10.4	0.9
21	0.0	8.0	8.5	21.0	0.0	0.6	1.4	25.4	0.0	0.0	10.9	0.0	0.0	0.0	4.6	0.0	0.8	6.8	0.0	7.0	2.8	11.0	-
22	22.9	0.6	0.0	1.4	0.0																		

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average		
7月1日	2.1	2.8	1.4	7.4	13.6	0.0	1.4	1.4	1.0	17.8	0.0	0.0	0.7	5.2	0.0	15.5	24.2	2.8	1.4	3.5	-	-	11.6		
2	0.0	9.7	0.3	15.8	0.4	3.8	0.3	0.0	0.2	2.8	12.0	0.0	0.8	0.0	0.8	0.0	1.4	10.5	0.0	4.4	5.6	-	-		
3	0.4	31.6	1.5	0.0	0.1	1.8	1.5	6.4	3.4	0.0	0.0	0.0	27.7	2.0	20.2	0.2	-	-	0.0	2.2	-	-	0.4		
4	3.2	0.0	0.0	46.4	0.0	0.6	0.0	11.3	1.8	13.0	0.6	0.0	15.4	2.2	4.8	4.3	3.2	41.0	0.0	1.4	-	-	-		
5	11.2	0.4	0.0	13.2	0.0	1.5	0.0	5.8	13.8	10.6	0.0	68.8	0.0	14.6	2.2	0.0	29.7	0.8	0.0	-	-	-	4.6		
6	0.0	0.3	7.9	5.4	0.0	1.0	7.9	0.2	0.0	8.8	0.0	0.0	1.0	0.0	0.8	0.0	18.2	0.4	0.0	-	-	-	27.2		
7	0.0	0.0	0.0	7.7	0.0	4.2	0.0	0.0	0.0	9.0	0.0	0.0	18.5	0.8	27.7	0.0	2.8	-	-	0.0	17.0	0.4	16.2		
8	0.0	3.6	0.0	3.8	0.0	5.2	0.0	6.0	10.4	15.2	0.8	0.0	1.1	0.0	0.8	0.4	2.2	6.8	36.4	14.6	-	-	-		
9	0.6	0.0	0.0	8.6	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	53.2	0.0	11.6	1.8	0.2	0.8	2.2	-	-	-	15.3		
10	3.3	0.0	0.0	6.6	0.0	23.6	0.0	0.0	0.0	0.0	0.0	4.7	5.0	0.0	0.0	8.2	-	17.2	4.8	-	-	-	-		
11	2.3	0.0	0.0	23.0	0.0	3.3	0.0	5.0	0.0	0.4	0.0	0.2	2.2	0.0	0.0	0.2	3.8	4.2	1.0	-	-	-	-		
12	14.7	0.0	10.2	0.6	12.4	0.6	10.2	0.0	0.6	2.0	1.9	6.8	8.0	0.0	0.5	0.0	-	1.6	0.0	-	-	-	-	18.4	
13	6.3	0.0	0.0	28.0	21.0	2.0	0.0	0.0	0.0	2.6	6.4	2.0	1.2	1.2	0.6	0.0	0.2	0.8	1.4	-	-	-	-	15.8	
14	7.2	7.7	0.0	0.0	0.0	16.8	0.0	0.0	0.0	3.0	2.8	22.4	0.0	*	0.0	0.0	0.2	-	0.0	-	-	-	-	16.2	
15	2.6	11.6	0.0	0.0	10.8	1.6	0.0	14.2	0.0	7.8	5.4	0.0	0.4	3.6	0.0	3.2	4.9	4.2	0.0	9.6	-	-	-	-	5.2
16	0.9	0.0	0.0	0.0	5.4	0.0	0.0	0.0	17.4	0.6	3.0	0.0	6.8	17.0	16.6	0.0	-	1.3	2.6	-	-	-	-	3.3	
17	16.6	0.0	0.0	0.0	19.6	0.0	4.8	0.0	0.0	7.3	7.8	0.0	22.8	0.0	10.4	0.0	19.0	0.7	0.8	7.6	-	-	-	-	
18	0.0	2.6	0.0	17.0	0.0	21.6	0.0	22.1	0.0	1.6	0.0	0.7	0.0	16.6	24.8	2.3	76.2	1.2	18.8	-	-	-	-	38.8	
19	0.0	0.0	52.3	12.2	0.0	20.5	52.3	0.0	1.5	0.4	3.5	0.0	0.0	21.4	5.1	4.0	-	42.8	0.0	-	-	-	-	-	
20	0.0	1.4	27.4	0.0	0.2	0.0	27.4	0.0	65.8	0.0	2.0	1.0	15.2	1.6	*	0.0	0.6	6.4	0.0	1.2	9.8	-	-	-	
21	7.0	2.2	4.2	0.3	7.6	0.0	4.2	50.0	0.0	0.0	26.4	0.0	0.0	0.4	6.8	0.8	4.1	-	0.0	-	-	-	-	2.6	
22	1.9	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	5.6	0.0	11.8	24.8	0.0	-	-	3.5	8.8	10.5	-	-	-	
23	62.8	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.4	0.0	0.0	27.2	1.6	0.0	2.0	17.0	-	-	-	
24	6.5	2.7	0.0	10.2	0.0	3.0	0.0	9.4	3.2	0.0	0.0	8.6	0.4	6.6	0.0	0.0	45.6	2.8	0.0	1.3	-	-	-	1.5	
25	44.6	0.0	0.0	9.2	0.0	1.3	0.0	0.0	0.9	0.0	5.9	2.2	0.0	0.0	9.8	3.5	-	0.4	0.0	20.5	-	-	-	-	
26	33.8	16.8	0.0	3.1	0.0	1.4	0.0	0.4	0.0	0.2	0.0	4.6	0.0	0.0	0.0	0.0	-	6.3	0.0	4.2	45.0	-	-	-	
27	0.0	2.2	0.0	38.4	0.0	0.0	0.0	0.0	0.0	1.4	0.0	46.6	2.0	0.0	2.2	3.4	-	3.4	0.0	1.8	-	-	-	-	
28	0.5	0.0	2.2	2.4	0.0	0.0	2.2	2.3	0.0	0.0	0.2	20.0	0.6	6.0	6.6	1.0	18.0	0.2	0.0	4.8	4.2	-	-	-	
29	1.2	11.0	0.0	0.8	0.0	0.0	0.0	1.2	40.8	0.0	0.0	0.0	0.0	0.4	3.4	2.0	4.4	-	0.0	4.5	-	-	-	2.7	
30	0.0	20.8	12.4	0.0	39.2	5.4	12.4	0.0	0.0	0.3	0.0	4.8	1.4	1.4	22.7	2.4	2.0	0.5	0.0	-	-	-	-	-	
31	4.7	0.0	0.2	0.0	12.4	5.5	0.2	0.0	0.0	0.0	5.0	12.5	0.0	5.8	15.3	18.1	-	0.4	0.2	0.6	-	-	-	-	
Total	234.4	127.4	120.0	288.1	142.7	125.2	124.8	135.7	169.6	111.8	84.1	227.8	166.7	145.9	190.8	74.1	285.3	159.1	73.1	110.0	226.8	88.1	155.1		
N	6.0	5.0	4.0	10.0	7.0	4.0	4.0	4.0	5.0	4.0	5.0	6.0	5.0	6.0	8.0	2.0	8.0	4.0	2.0	3.0	9.0	4.0	5.1		

Phnom Penh Daily Rainfall -7

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average	
8月1日	0.9	0.0	0.2	0.6	2.6	0.0	6.2	0.3	28.2	0.6	19.7	16.0	0.0	0.0	0.0	45.1	0.8	-	34.2	3.0	1.6	-	-	
2	0.2	0.0	0.0	7.4	0.0	0.0	2.6	21.2	0.4	1.6	0.0	2.0	0.0	0.0	0.0	2.2	1.5	0.8	0.2	15.2	10.8	-	-	
3	0.0	1.6	0.0	36.4	0.0	0.3	0.0	19.8	3.1	1.4	0.0	0.0	0.0	0.6	0.0	14.0	-	15.8	0.0	1.7	0.6	-	-	
4	0.0	40.6	0.0	1.6	4.6	0.0	0.0	0.3	0.0	3.4	1.8	2.8	2.0	0.0	0.0	11.2	-	1.1	0.4	1.4	-	-	-	
5	0.5	0.0	0.0	0.0	4.1	0.0	3.9	30.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.2	-	1.5	0.0	21.8	-	-	-	
6	10.2	16.8	0.0	0.0	11.0	0.6	0.0	0.1	2.5	0.0	21.2	2.2	0.0	7.4	0.0	1.0	32.4	1.8	8.5	31.2	-	-	-	
7	4.7	0.0	0.1	0.0	0.0	0.0	0.1	0.0	10.6	0.5	15.0	0.5	0.0	10.6	0.0	17.8	-	-	56.5	-	-	-	-	2.0
8	1.6	0.0	5.3	0.0	0.0	0.0	5.3	1.5	2.0	0.0	0.3	0.0	0.3	0.0	0.0	0.8	0.7	1.8	28.8	26.8	2.4	27.6	-	
9	0.0	0.6	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0	1.1	0.0	0.0	35.6	0.0	0.0	16.8	47.9	0.4	0.2	2.2	-	-	
10	0.0	1.6	1.4	0.0	5.6	0.0	1.4	8.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	21.0	9.0	-	1.8	0.9	-	-	2.8	
11	0.0	2.0	0.0	0.0	3.6	0.0	0.0	0.0	7.9	1.4	6.0	1.6	0.0	8.8	3.2	0.0	-	16.6	8.5	8.8	-	-	-	10.2
12	0.0	0.0	4.3	0.0	0.0	5.6	4.2	0.0	2.8	7.3	0.0	5.5	1.8	29.4	0.0	0.3	0.6	-	2.8	3.2	-	-	-	
13	32.2	0.0	5.0	0.0	0.0	12.2	5.0	0.0	32.4	0.0	12.2	18.8	2.8	0.6	7.0	7.1	1.6	25.0	0.5	-	-	-	0.2	
14	21.8	0.4	9.8	0.0	0.0	0.0	9.8	0.0	7.4	0.1	9.7	100.7	0.0	0.0	40.5	0.2	0.4	38.6	6.6	5.0	19.0	0.4	-	
15	0.0	8.6	25.2	0.0	0.0	5.2	25.2	0.0	35.9	0.0	14.4	7.6	8.4	1.0	0.0	23.7	-	8.0	0.0	-	-	-	-	0.5
16	9.3	20.6	2.6	0.0	1.6	14.2	2.6	0.6	3.0	12.3	0.0	10.2	36.8	0.0	6.0	0.0	-	2.6	0.0	-	-	-	-	2.2
17	0.0	1.3	0.2	5.0	6.0	0.2	0.2	0.0	18.0	11.7	0.0	0.0	1.0	2.0	0.0	0.4	1.8	1.8	3.6	-	-	-	-	
18	3.0	14.6	19.6	0.0	8.2	5.8	19.6	3.8	2.0	6.3	0.0	35.9	0.0	0.0	25.0	2.1	-	0.7	4.2	-	-	-	-	4.2
19	2.4	0.3	0.2	0.8	0.0	65.7	0.2	24.2	43.0	5.9	0.9	10.0	0.0	10.7	0.2	0.2	-	2.2	14.6	-	-	-	-	
20	21.9	0.0	0.3	25.9	8.0	18.1	0.3	1.2	35.8	0.0	2.0	0.0	0.0	0.0	14.0	1.0	-	8.2	0.0	-	-			

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
9月1日	0.0	0.0	0.2	1.2	1.8	3.6	1.1	0.6	0.0	27.2	0.0	4.5	0.9	0.0	1.5	0.8	2.4	1.5	3.4	—	5.9	26.0	
2	0.0	2.7	0.0	0.0	4.8	5.7	6.2	29.8	0.0	20.6	12.2	0.2	9.6	0.0	0.0	4.9	1.8	—	42.6	4.8	31.8	0.4	
3	2.8	0.3	0.0	2.1	0.0	23.0	0.0	16.1	3.6	6.7	44.3	4.5	14.3	0.0	0.0	34.0	—	89.1	1.5	9.2	—	1.2	
4	0.0	8.8	0.0	0.0	5.0	0.2	0.0	0.2	0.0	8.6	0.0	0.0	0.0	0.0	21.6	0.4	49.4	5.6	0.0	2.0	—	—	
5	9.5	0.0	0.8	5.6	19.6	0.0	0.8	0.0	18.8	0.5	34.8	2.0	4.6	0.0	0.8	0.0	—	—	19.2	0.4	—	—	6.7
6	0.5	1.2	0.0	0.4	24.0	32.8	0.0	0.0	7.4	4.2	0.6	7.6	0.0	0.0	0.3	1.2	—	—	0.0	—	0.3	17.8	
7	0.0	0.0	0.0	0.2	0.0	4.0	0.0	0.0	32.6	5.0	0.0	10.2	0.3	0.0	0.0	28.2	8.5	17.6	0.0	2.4	0.8	34.4	
8	6.1	2.0	0.0	23.6	0.0	12.5	0.0	0.0	5.0	0.3	0.0	0.0	0.0	0.0	43.0	1.8	—	3.6	24.6	—	—	—	
9	0.0	12.0	0.0	0.5	1.3	0.0	0.0	0.4	38.5	57.2	8.6	85.2	0.0	0.0	13.0	18.8	11.6	5.1	6.6	—	—	—	
10	0.0	0.3	0.0	1.0	0.0	17.8	0.0	0.0	32.4	8.6	0.6	0.3	2.4	0.0	16.2	0.4	26.4	24	93.8	—	—	21.6	2.6
11	0.0	13.6	1.4	0.0	36.4	17.8	1.4	10.0	2.0	2.2	10.0	3.7	24.6	0.0	1.2	19.6	9.7	22	15.0	2.2	5.2	0.5	
12	4.4	0.0	50.4	0.0	26.2	1.4	50.4	13.6	0.7	7.2	0.0	2.8	2.0	0.0	0.4	9.0	11.8	—	4.3	1.0	—	—	4.5
13	24.7	59.6	1.8	0.8	5.6	1.9	1.8	0.0	0.6	10.2	0.0	0.0	0.0	0.0	0.0	10.2	—	—	24.8	42.0	79.3	26.1	
14	3.6	0.0	63.5	0.0	6.2	1.0	0.0	11.8	10.0	42.2	48.6	0.0	13.6	7.8	0.0	0.0	1.5	4.5	4.8	12.2	6.4	36.0	
15	0.0	5.7	16.1	2.0	0.6	0.0	0.0	17.0	3.3	11.8	16.9	0.0	16.6	0.0	0.6	5.9	46.0	—	0.0	21.2	1.6	13.1	
16	0.6	4.2	0.0	5.0	1.1	0.0	16.1	0.0	1.0	0.0	8.0	22.3	0.7	0.0	7.8	14.6	0.2	11.5	0.0	15.8	—	—	0.6
17	0.0	0.0	0.3	24.2	0.0	0.0	0.3	1.2	0.0	0.0	10.8	0.6	0.0	43.2	1.2	14.5	29.5	0.1	0.4	8.6	12.2	—	
18	1.8	14.8	18.6	13.5	1.7	0.3	18.6	0.0	2.6	33.3	17.7	0.0	0.0	0.0	21.5	0.0	1.6	10.8	0.0	0.2	22.8	42.8	
19	3.2	0.0	51.0	0.5	0.3	6.0	51.0	3.2	0.0	0.0	0.0	5.8	18.4	0.0	0.0	0.0	—	—	0.0	—	12.4	10.8	
20	35.9	0.0	4.0	40.0	5.4	9.2	0.8	15.4	0.6	0.0	0.0	46.0	0.0	0.0	16.8	0.0	8.6	16.1	0.5	4.4	6.5	4.8	
21	5.3	1.8	0.0	0.0	4.2	67.9	0.0	8.6	0.0	11.4	0.0	3.8	43.7	0.0	0.2	6.4	20.0	1.5	38.6	22.6	—	—	
22	6.0	0.0	0.0	3.4	0.8	19.6	0.0	0.0	3.8	36.8	0.0	0.8	3.6	0.0	0.0	2.2	2.8	49.0	19.2	43.8	2.5	6.8	
23	0.7	33.3	2.4	87.0	0.0	0.4	2.4	0.0	42.0	1.0	1.6	9.5	1.2	0.0	0.0	4.2	9.6	15.4	7.0	19.6	—	—	7.3
24	0.0	5.0	0.0	0.0	44.0	1.0	0.0	0.0	3.0	0.8	36.0	0.6	4.0	0.0	0.0	7.6	1.4	37.6	—	—	1.0	4.2	
25	0.0	29.0	2.9	21.0	3.2	9.9	2.9	0.0	0.4	0.2	22.3	0.0	10.6	0.0	46.1	12.6	—	—	0.0	0.2	40.5	0.8	
26	5.0	0.0	26.8	10.3	4.4	8.8	26.8	0.0	52.0	1.5	0.0	6.8	78.0	0.0	0.0	0.0	12.6	—	0.0	—	11.8	—	
27	0.0	1.4	39.7	9.2	6.8	0.4	39.7	1.0	10.0	0.0	20.3	30.6	3.9	0.0	0.0	5.6	0.8	4.2	0.0	59.5	43.2	17.2	
28	1.0	28.0	5.3	19.6	7.8	7.2	5.3	7.7	0.2	3.8	1.4	16.6	11.0	0.0	82.0	1.8	79.0	82.8	0.0	0.6	2.2	—	
29	0.8	20.0	0.0	26.3	22.9	2.2	0.0	11.4	15.3	0.9	5.0	0.0	1.6	0.0	0.5	48.5	7.2	0.3	4.8	—	—	1.6	
30	12.8	10.3	0.0	1.1	3.1	43.8	2.6	7.1	4.4	0.0	24.6	0.0	0.5	0.0	0.0	8.2	21.6	0.0	1.6	3.6	1.0	—	
Total	124.7	254.0	281.6	298.5	237.2	298.4	228.2	155.1	290.2	300.2	324.3	244.4	266.1	51.0	274.7	245.6	356.8	326.3	348.8	274.3	311.5	267.2	261.8
N	3.0	9.0	7.0	9.0	6.0	8.0	6.0	8.0	9.0	9.0	12.0	6.0	9.0	1.0	8.0	9.0	9.0	9.0	9.0	8.0	9.0	9.0	7.8

Phnom Penh Daily Rainfall -9

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
10月1日	12.2	21.5	2.6	0.4	24.8	3.4	0.0	21.5	0.0	2.6	41.0	0.0	1.5	0.0	0.0	5.4	—	—	33.1	1.6	8.0	19.2	
2	3.5	8.5	2.3	20.8	0.0	0.0	2.3	11.6	28.0	22.8	59.0	35.6	4.2	0.0	0.0	1.3	—	1.4	45.8	—	—	5.8	45.8
3	0.2	20.0	1.9	15.4	15.8	0.0	1.9	6.4	15.7	0.0	0.1	0.2	0.2	0.0	0.0	3.7	7.0	7.6	6.3	15.0	0.8	—	
4	0.0	14.0	6.4	14.4	7.4	86.5	6.4	3.4	0.0	0.0	15.2	35.4	5.0	0.0	0.0	0.0	—	3.4	8.2	—	—	56.4	28.8
5	53.0	19.0	2.2	1.2	26.0	0.0	2.2	0.8	0.0	0.5	5.2	2.6	5.8	0.0	19.2	0.5	31.0	—	3.0	—	—	8.2	42.8
6	2.8	28.8	0.7	4.6	74.0	0.0	0.7	5.6	15.3	1.4	0.0	27.7	58.8	33.2	8.4	0.0	65.8	—	13.9	12.0	1.0	1.2	
7	0.8	2.0	0.0	1.2	0.0	0.0	0.0	9.0	0.0	1.4	13.9	0.0	4.8	36.0	0.0	2.3	19.3	—	0.0	10.0	19.6	1.2	
8	1.0	25.0	0.8	0.4	10.0	0.8	0.8	0.0	2.3	0.0	0.0	37.0	1.8	0.0	3.6	39.3	38.7	50.3	24.4	4.0	0.8	—	
9	4.8	42.4	12.4	0.0	0.0	25.0	12.4	0.4	1.2	0.0	0.0	1.8	0.2	0.0	14.3	0.8	59.4	—	0.0	0.2	82.0	0.8	
10	62.0	2.0	1.0	2.9	0.9	0.0	1.0	0.7	44.6	7.8	73.0	37.6	6.8	0.0	0.4	9.5	—	0.0	—	—	21.6	5.4	
11	41.6	18.0	21.9	0.0	1.3	0.0	21.9	1.3	0.0	6.7	94.4	17.2	0.0	0.2	0.0	0.4	10.7	6.2	0.0	1.5	64.2	0.4	
12	28.3	3.4	10.0	0.0	0.3	2.0	0.0	7.0	0.0	1.6	11.3	3.2	0.0	5.0	24.4	6.0	4.2	—	57.0	34.6	1.0	—	
13	4.2	7.6	2.2	5.8	0.0	12.8	10.0	21.6	0.5	3.8	1.2	0.0	0.0	0.0	0.0	0.8	—	0.7	7.8	5.0	45.0	24.0	
14	14.2	2.6	0.0	47.8	6.0	8.5	2.8	5.1	0.2	0.0	17.2	0.8	4.2	21.5	0.0	44.8	4.0	5.6	2.7	—	—	0.8	0.6
15	0.8	0.0	5.0	9.2	9.0	27.6	0.0	4.8	1.0	7.7	8.1	8.2	2.2	4.4	0.0	0.6	0.2	0.3	0.0	11.0	19.8	4.0	
16	0.0	0.0	79.3	5.8	26.2	0.0	5.0	57.4	0.0	6.6	0.0	0.0	0.0	15.0	0.0	0.0	0.4	4.0	0.0	—	3.4	19.4	
17	4.2	15.5	5.6	11.2	0.0	23.0	79.3	5.3	0.4	4.0	9.3	4.0	0.0	13.0	0.0	0.0	—	29.5	3.6	—	6.8	4.2	
18	0.0	6.0	16.4	0.0	0.0	0.0	5.6	0.0	21.0	10.8	4.0	7.8	0.0	0.0	40.7	0.0	46.2	0.4	0.0	43.0	14.6	—	
19	2.0	3.2	0.0	1.0	0.0	4.8	16.4	0.0	28.5	2.0	7.6	42.4	0.0	0.0	17.4	67.5	14.2	0.8	29.9	7.8	37.6	0.1	
20	83.2	0.0	0.0	6.1	0.0	4.9	0.0	0.0	0.0	0.0	0.8	11.8	0.0	0.0	3.6	2.8	13.5	—	0.4	—	—	102.6	
21	0.0	17.8	0.8	0.2	0.0	2.0	0.0	0.0	20.3	0.0	0.0	0.0	0.0	7.8	14.0	0.0	0.6	—	0.5	—	38.2	1.5	
22	13.2	79.8	17.6	5.5	0.0	43.4	0.8	22.0	8.4	3.0	0.0	12.8	10.2	55.7	24.0	0.0	10.8	2.9	0.0	—	—	1.2	
23	1.0	16.2	0.0	6.2	0.0	29.2	17.6	0.0	16.4	18.4	0.0	1.6	17.1	8.3	0.0	0.4	—	21.8	4.4	—	—	4.8	
24	0.0	21.2	0.0	14.2	0.0	13.8	0.0	0.0	7.6	0.3	15.0	0.8	0.0	0.0	0.0	0.0	—	0.4	5.0	0.7	—	—	
25	52.8	0.6	0.0	1.5	0.0	31.0	0.0	3.0	2.0	8.8	4.7	0.0	0.0	3.0	34.5	2.2	23.7	3.0	15.6	—	—	—	
26	1.5	13.8	0.0	0.0	0.0	18.4	0.0	24.8	1.0	0.0	3.5	15.6	0.0	0.0	11.2	5.							

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
11月1日	7.8	12.8	0.0	0.0	0.0	0.0	0.0	0.9	0.8	0.0	0.0	0.0	2.8	0.0	2.0	0.2	2.2	-	-	-	1.8	5.6	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	1.5	0.0	0.0	20.2	31.8	-	-	-	9.0	-	-	-	-
3	0.0	3.0	0.0	1.0	0.0	0.7	0.0	0.0	5.6	15.2	0.0	0.2	36.0	0.0	0.0	4.8	0.2	-	5.0	5.0	-	-	-
4	0.0	18.4	0.0	0.0	0.0	6.7	0.0	1.0	6.2	0.0	0.0	6.1	0.0	0.0	11.8	0.4	1.2	0.0	-	-	-	-	7.6
5	0.0	6.3	0.0	0.0	0.0	7.8	0.0	0.8	17.0	0.0	0.0	40.8	3.1	0.0	10.1	0.5	5.0	0.6	0.0	-	-	-	1.2
6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	23.8	7.0	0.0	5.6	0.0	33.2	18.0	12.2	40.2	-	0.0	-	-	-	26.0
7	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	16.2	0.0	39.2	0.0	26.4	36.0	24.1	1.3	0.5	-	0.0	2.2	13.2	4.8	4.8
8	0.0	0.0	0.6	0.0	20.0	26.7	0.6	0.0	30.8	0.0	2.1	1.8	0.0	0.0	19.8	19.0	-	9.6	2.0	-	-	-	40.2
9	0.0	0.0	0.0	0.0	2.5	0.2	0.0	0.0	39.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	27.2	20.2	0.0	-	-	-	17.4
10	0.0	0.0	0.0	0.0	1.5	2.6	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	10.3	0.0	-	-	0.7	-	-
11	1.1	0.0	0.0	4.0	0.0	1.0	0.0	23.8	0.0	0.0	0.0	0.3	2.8	0.2	0.0	0.0	-	33.2	0.0	9.0	0.3	10.5	-
12	26.8	0.0	0.0	10.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	5.0	0.0	1.0	46.0	-	-	0.0	2.4	-	-	-
13	0.0	0.0	0.0	0.2	0.0	10.5	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	10.5	5.2	2.2	-	29.4	-
14	0.0	0.0	0.0	0.0	8.7	0.0	0.0	7.2	1.2	0.0	27.5	0.0	0.0	21.5	0.0	0.0	-	0.5	2.8	-	-	17.3	-
15	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	40.0	0.0	5.9	0.0	4.0	4.4	0.0	0.0	-	18.0	0.0	-	-	10.4	-
16	26.2	0.0	0.0	0.0	20.8	6.2	0.0	0.0	0.0	0.0	0.0	0.0	78.0	15.0	0.0	0.0	-	0.8	0.0	-	-	4.2	-
17	29.7	0.0	5.4	0.0	0.0	5.4	0.0	4.6	0.0	0.0	0.0	0.0	13.0	0.0	0.0	-	-	-	-	-	-	-	31.6
18	12.0	0.0	0.0	0.0	0.0	19.0	0.0	5.4	1.2	0.0	1.0	0.0	0.8	0.0	0.0	0.0	31.0	2.8	9.4	-	-	10.0	-
19	13.5	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.5	18.3	6.2	0.0	0.0	0.0	-	28.4	1.6	-	-	-	-
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	1.0	0.0	-	1.0	-	-
21	0.0	0.0	0.0	26.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.0	0.0	22.0	1.0	0.0	-	27.6	-	-
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	55.7	0.0	0.0	19.7	-	-	0.0	-	-	51.8	-
23	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	8.3	1.5	0.0	6.8	4.4	0.0	-	-	-	-
24	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	4.0	0.0	21.6	0.0	-	0.0	3.4	-	-	-	-
25	0.3	0.0	0.0	0.0	16.3	0.1	6.4	0.0	0.0	0.0	0.0	0.0	40.6	3.0	0.0	0.0	-	-	21.4	-	-	-	-
26	0.0	0.0	6.4	0.0	44.4	0.6	0.0	0.0	0.7	0.0	0.0	0.0	0.0	31.2	0.0	-	-	14.5	-	-	-	-	-
27	0.0	0.0	0.0	0.0	3.2	21.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	8.8	0.0	0.0	-	-	2.2	-	-	-	-
28	0.0	0.0	0.0	0.0	3.4	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-
29	0.4	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	16.6	0.0	0.0	0.0	0.0	0.0	-	0.2	0.0	-	0.5	-	-
30	0.0	0.0	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	-	-	0.0	-	-	5.4	-
Total	124.7	40.5	12.4	42.8	118.8	132.7	12.4	63.2	190.7	33.5	94.3	67.0	215.7	211.9	148.4	92.4	201.2	142.7	64.1	33.2	45.1	273.4	107.3
N	5.0	2.0	0.0	2.0	4.0	5.0	0.0	2.0	6.0	2.0	3.0	2.0	4.0	6.0	7.0	4.0	6.0	6.0	2.0	0.0	2.0	10.0	3.6

Phnom Penh Daily Rainfall -11

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average	
12月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	4.6	4.2	-	-	-	-	-	-	-	-
2	0.0	0.0	7.5	0.0	0.0	14.9	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
4	0.0	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	6.6	0.0	-	-	-	-	-
5	0.0	0.0	0.0	0.0	0.0	21.6	0.5	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	17.8	-	-	-	-	-	-	-
6	0.6	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.6	-	-	0.0	-	-	-	-	-
7	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	6.9	-	-	0.9	-	-	-	-
8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
9	0.0	0.0	0.0	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
11	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-	1.4	-	-	-	-	-
12	100.1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	-	-	0.0	-	-	-	-
13	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.1	-	-	0.0	-	-	-	-
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	7.8	0.0	0.0	18.6	-	-	0.0	-	-	-	-
15	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.0	-	-	0.0	-	-	-	-	-
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.2	0.0	0.0	0.0	0.0	0.0	5.2	-	-	0.0	-	-	-	-
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	0.0	0.0	-	-	0.0	-	-	-	-	-
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
19	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
20	182.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-	-	0.0	-	-	-	-
21	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	8.7	-	-	0.0	-	-	17.0	-	-
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	27.4	-	-
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	67.4	31.6	-	-
25	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	1.8	1.6	-	-	-	-
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	1.7	0.0	-	-	-	-
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	7.6	20.0	-	-	-	-
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.6	0.0	-	-	-	-
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8	0.0															

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
3月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	04.8	00.0	16.6	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.5	-
7	0.0	0.0	0.0	9.6	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	0.0	-	-
8	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8	0	00.1	01.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.2	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
10	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
12	0.0	30.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
13	0.0	12.6	0.0	0.0	0.0	0.0	29.8	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	20.3	0.0	0.0	2.5	-	-
14	0.0	0.0	0.0	0.0	0.0	0.0	31.5	0.0	0	0	0	00.0	00.0	26.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
17	0.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
18	0.0	24.6	0.0	0.0	0.0	0.0	0.0	0.1	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
19	0.0	20.0	0.0	0.0	0.0	0.0	0.0	15.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	-
20	0.0	20.9	0.0	11.2	0.0	0.0	0.0	0.7	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	0.0	-
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	34.8	00.0	0.0	13.2	0.0	0.0	3.7	10.6	0.0	0.0	-	-
22	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0	0	0	34.7	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	1	0	11.7	01.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
24	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	2.1	2.1	0	00.0	02.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
25	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0.1	00.0	00.0	0.0	0.0	0.0	0.0	4.0	1.0	0.0	0.0	-	-
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
28	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
29	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
30	0.0	19.5	0.0	0.0	0.0	0.0	38.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
31	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	35	35	0	00.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	0.0	-	-
Total	0.0	164.4	10.2	20.8	0.2	0.4	100.8	16.1	39.9	39.9	0.1	86.1	39.9	43.2	13.2	0.0	0.0	28.8	47.9	0.0	25.0	0.0	30.8
N	0.0	7.0	1.0	1.0	0.0	0.0	3.0	1.0	1.0	1.0	0.0	3.0	1.0	2.0	1.0	0.0	0.0	1.0	2.0	0.0	1.0	0.0	1.2

Siemreap Daily Rainfall-3

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
4月1日	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	175.0	0.0	2.0	-	-	-
2	0.0	0.0	0.0	0.0	0.0	7.3	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0	0	02.2	00.1	0.0	8.3	0.0	0.0	0.0	0.0	0.0	-	-	-
4	0.0	0.6	0.0	0.0	22.7	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	38.5	-	-	-
5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0	0	00.0	00.6	0.0	63.2	0.0	0.0	7.4	0.0	0.0	-	-	-
6	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	32.4	8.5	0.0	-	-	-
7	0.0	0.0	0.0	0.0	0.0	0.0	31.4	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	14.2	-
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	39.8	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	5.0	-
9	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.1	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
10	18.2	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
11	2.4	0.0	16.0	0.0	0.0	0.0	0.0	2.8	0	0	0	00.0	00.0	4.3	2.0	0.8	0.0	0.0	0.0	0.0	73.5	-	-
12	24.2	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	08.8	00.0	+	0.0	0.0	0.0	0.0	0.0	0.0	16.4	-	-
13	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	4.2	0	00.6	04.2	0.0	0.0	0.0	0.0	18.3	0.0	0.0	-	-	-
14	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	4.2	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.0	-	-
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	2.1	3.0	0.0	0.0	0.0	0.0	0.0	17.1	-	-
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	25.6	25.6	0	32.1	25.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	-
19	0.0	0.0	0.0	0.0	0.0	11.3	23.4	1.4	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	28.4	-
20	3.5	0.0	0.0	0.0	13.4	0.0	0.0	0.0	0	0	0	00.2	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
21	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	40.2	00.0	0.0									

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
5月1日	0.0	2.0	39.2	0.0	0.0	0.0	0.0	5.7	0.2	0.2	0	00.0	00.2	0.0	0.0	23.6	0.0	5.5	0.0	0.0	-	-	14.6
2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	0	00.0	03.4	0.0	15.5	0.0	0.0	0.0	0.0	0.0	-	-	-
3	7.2	0.0	1.2	0.2	0.3	0.0	0.0	0.0	0.6	0.6	0	00.0	00.6	3.1	4.4	0.0	0.0	0.0	7.3	0.0	-	-	-
4	1.2	0.0	0.0	0.0	9.7	0.0	0.0	0.0	2.1	2.1	0	00.0	02.1	4.6	25.9	0.0	0.0	10.5	0.0	0.0	-	-	-
5	19.2	0.0	0.0	0.0	1.3	0.0	0.0	2.8	0	0	0	00.0	00.0	0.0	0.0	1.0	3.0	0.0	0.0	-	-	-	
6	0.0	0.0	8.4	0.0	0.0	0.0	0.0	32.4	39.3	39.3	0	00.0	39.3	0.0	10.6	0.0	0.0	7.2	0.0	2.5	-	-	47.8
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	0	0	0	04.6	00.0	0.0	0.0	0.0	0.0	17.4	20.5	0.0	-	-	-
8	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0	0	0	00.0	00.0	3.4	0.0	0.0	0.0	0.0	22.3	0.0	-	-	-
9	0.0	7.8	0.0	0.0	1.2	0.0	0.4	4.6	0	0	0	10.0	00.0	2.3	0.0	4.2	0.0	7.2	0.0	0.2	-	-	-
10	16.5	0.0	0.0	0.0	9.7	0.0	5.0	9.0	15.2	15.2	5.8	00.0	15.2	0.0	0.0	0.0	0.0	7.2	41.1	24.5	-	-	5.4
11	2.2	2.4	0.0	0.5	0.0	0.0	7.4	0.3	23.2	23.2	0	00.0	23.2	0.0	5.2	0.0	0.0	0.2	0.0	11.0	20.1	-	-
12	10.8	8.4	0.0	18.7	0.0	0.0	0.0	7.4	27.8	27.8	0	00.0	27.8	0.0	0.0	3.6	0.0	0.0	0.0	0.0	-	-	-
13	5.2	25.0	0.0	10.0	7.0	0.0	7.6	81.7	27.5	27.5	0	00.0	27.5	0.0	0.0	4.1	0.0	*	0.0	28.5	-	-	-
14	18.6	42.2	0.0	0.0	22.1	2.1	4.0	0.0	28	28	0	00.0	28.0	0.0	0.0	0.0	0.0	0.3	6.3	0.0	10.2	-	-
15	8.7	14.8	0.0	0.0	6.2	0.0	0.0	16.9	23.3	23.3	4.4	00.0	23.3	0.0	0.0	0.0	0.0	0.0	0.0	1.4	-	-	-
16	5.7	45.2	0.1	0.0	0.0	0.0	0.0	9.5	9.5	0	0	00.0	09.5	6.7	6.5	0.0	8.6	8.5	0.0	10.5	-	-	-
17	1.4	46.7	0.0	20.6	23.2	10.2	12.8	1.8	16.2	16.2	0	30.7	16.2	0.0	2.5	0.0	1.2	0.3	0.0	1.5	37.5	-	-
18	5.4	0.0	0.0	5.5	0.0	2.8	5.2	0.0	7.4	7.4	13.8	00.0	07.4	4.6	0.0	0.0	0.0	0.0	0.0	3.4	0.9	2.0	
19	0.0	0.0	0.0	1.8	0.0	0.0	6.3	0.0	15.4	15.4	0	00.0	15.4	0.0	4.4	0.0	0.0	25.2	0.0	6.1	1.8	7.6	
20	5.6	0.0	0.0	38.1	0.0	125.6	6.0	1.8	28.4	28.4	0	26.6	28.4	29.9	10.3	6.0	0.0	6.0	8.6	0.0	17.0	6.9	
21	2.8	1.4	0.0	0.0	5.1	1.0	2.2	11.6	4.8	4.8	0	00.0	04.8	0.0	18.3	0.0	0.0	9.5	12.3	3.6	-	-	-
22	0.0	7.8	37.2	1.8	0.0	0.1	0.3	0.0	0.2	0.2	0.1	01.4	00.2	10.8	4.1	0.0	0.0	0.0	20.1	22.0	20.5	6.0	
23	8.6	3.8	24.1	1.0	0.0	0.0	0.0	2.5	2.5	1	0	08.4	02.5	0.0	0.0	0.0	21.2	0.2	0.0	0.0	64.0	-	
24	11.2	0.0	9.6	5.2	66.6	2.2	0.0	0.0	36.5	35.6	0	00.0	35.6	0.0	0.0	0.0	10.1	0.5	*	0.0	-	-	2.6
25	0.4	43.0	41.5	15.6	6.4	0.0	0.9	0.1	1.2	1.2	0.8	00.5	01.2	0.0	0.0	0.0	0.0	0.4	0.0	1.8	21.0	7.6	
26	5.1	0.0	13.2	0.0	0.0	0.0	0.0	0.0	0	0	0	00.4	00.0	0.6	0.0	0.0	0.0	2.0	0.0	3.0	7.8	14.4	
27	0.0	20.6	32.6	0.0	0.0	27.2	0.0	0.0	0	0	13.8	00.0	00.0	0.0	8.6	0.0	0.0	3.0	4.0	11.4	23.5	14.6	
28	0.0	12.0	0.0	0.0	0.0	3.6	0.0	0.0	1.4	1.4	0.1	20.6	01.4	0.0	0.0	0.0	2.8	3.2	0.0	0.3	44.0	-	
29	0.0	6.8	0.0	0.0	0.0	8.7	3.0	0.0	0	0	0	04.2	00.0	6.8	0.0	0.0	19.9	6.5	7.5	0.0	5.5	-	
30	20.6	30.0	0.0	0.3	26.3	2.6	1.5	0.0	4	4	0	02.7	04.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	23.5	-	
31	6.0	2.4	0.0	0.0	0.7	0.3	0.9	0.6	35.2	35.2	41	01.6	35.2	11.0	0.0	0.0	0.0	0.0	0.0	3.0	5.4	-	-
Total	167.1	322.3	207.1	119.3	185.8	186.4	65.3	187.9	353.3	352.4	80.8	111.7	352.4	83.6	119.6	41.6	64.8	122.8	149.0	134.5	302.7	129.5	174.5
N	6.0	9.0	8.0	5.0	4.0	3.0	1.0	5.0	11.0	11.0	3.0	4.0	12.0	3.0	5.0	1.0	3.0	3.0	5.0	6.0	10.0	4.0	5.5

Siemreap Daily Rainfall-5

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
6月1日	16.1	0.0	0.0	9.0	0.0	0.0	0.0	0.6	0	0	41	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	-	-
2	7.2	0.0	2.7	8.6	2.0	0.5	0.0	0.0	4	4	37.2	00.0	04.0	0.0	0.0	0.0	0.0	0.0	33.2	0.0	46.7	-	-
3	24.2	0.0	14.4	8.7	19.4	15.0	4.1	0.0	0	0	1.5	00.8	00.0	4.1	0.0	0.7	0.0	0.0	10.0	0.0	4.0	-	-
4	0.9	9.8	12.4	30.8	0.4	0.4	56.9	0.0	0	3	4	00.0	03.0	6.4	2.8	0.0	0.0	0.0	0.0	21.5	20.0	-	-
5	0.1	1.7	6.6	0.0	0.7	12.2	0.0	34.2	0	0	10.8	00.0	00.0	28.4	0.0	0.0	20.0	0.0	17.4	8.2	61.0	24.8	
6	0.0	0.0	0.0	0.0	2.0	0.0	11.0	0.0	0.2	0.2	0.2	00.0	00.2	0.0	0.0	0.0	0.0	0.0	1.0	44.4	19.7	36.8	
7	0.0	27.0	0.0	0.0	14.0	7.9	0.0	0.0	0	0	0.4	09.4	00.0	0.0	3.5	12.6	0.0	8.2	0.0	9.5	-	-	
8	0.0	8.8	32.4	8.2	1.0	3.2	0.0	0.0	1.2	1.2	5.6	02.6	01.2	3.1	0.0	0.0	0.0	23.5	8.4	13.2	6.5	-	
9	14.0	1.0	0.0	0.0	1.8	0.1	0.0	0.0	1	1	78.1	01.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	87.5	13.5	5.2	
10	12.2	0.0	4.5	0.0	3.0	2.7	0.0	0.0	16.8	16.8	0	06.2	16.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.3	2.4	
11	0.0	3.0	34.5	0.0	6.2	0.0	0.0	0.0	5.7	5.7	0	09.2	05.7	0.0	8.3	0.0	2.4	0.6	*	0.0	12.0	12.8	
12	3.0	0.0	7.6	80.5	50.2	0.0	0.0	0.0	69.6	69.6	0	17.2	69.6	0.0	11.4	0.0	8.4	0.0	0.0	0.0	36.5	4.3	
13	0.0	0.0	0.0	13.4	107.8	0.0	0.0	0.0	0.9	0.9	2	00.2	00.9	0.0	5.2	5.3	0.0	0.0	0.0	0.0	5.7	2.9	
14	1.6	0.6	0.0	0.6	3.0	0.0	15.0	0.0	17.2	17.2	17	04.6	17.2	0.0	2.5	37.1	0.0	3.8	0.0	0.0	105.6	3.4	
15	27.2	10.0	0.0	0.6	12.0	30.1	0.0	0.0	5.9	5.9	0	13.2	05.9	0.0	3.3	0.0	0.0	0.0	0.0	0.0	36.5	-	
16	28.4	0.0	2.4	0.9	0.5	0.2	0.4	4.3	14.8	14.8	1	01.4	14.8	0.0	0.0	16.3	4.3	0.0	13.5	2.5	37.1	22.0	
17	47.8	4.4	21.5	28.3	0.4	9.6	24.8	0.8	3	3	0	00.3	03.0	0.0	0.0	0.0	8.8	0.0	0.0	25.8	61.4	-	
18	29.8	0.0	21.9	0.2	40.2	0.0	4.0	26.2	2.6	2.6	0	07.7	02.6	2.3	0.0	16.4	5.7	0.0	0.0	14.0	-	-	
19	1.4	0.0	36.7	3.0	39.2	0.0	0.0	1.6	3.8	3.8	1.2	19.2	03.6	0.0	4.2	7.0	15.1	0.0	13.8	0.0	2.8	-	
20	3.8	0.0	66.0	4.2	53.0	1.4	20.8	26.8	0	0	0	04.7	00.0	0.0	22.3	2.1	35.2	0.0	0.0	0.0	-	-	
21	0.0	0.0	67.8	19.8	13.0	15.1	0.0	4.8	8.6	8.6	4.8	01.3	08.6	2.4	13.2	0.0	0.0	0.0	2.0	0.0	-	-	1.4
22	13.1	15.8	0.2	0.2	8.2	2.3	0.0	16.2	0	0	4	00.0	00.0	0.0	9.8	0.0	3.8	0.0	0.0	0.0	18.0	4.2	
23	0.1	38.6	4.4	0.0	2.2	12.6	1.8	32.9	0.1	0.1	0.2	00.0	00.1	0.0	0.0	31.7	26.4	0.0	0.0	0.0	-	-	44.0
24	3.2	11.2	10.2	0.0	0.0	0.0	3.8	5.4	0	0	14.6	00.0	00.0	0.0	55.6	11.1	202.0	0.0	0.0	3.0	7.8	-	
25	5.0	6.4	0.0	0.0	0.5	0.0	1.8	1.8	45.4	45.4	0	00.0	45.4	0.0	19.3	30.1	0.0	10.1	11.0	25.5	-	-	-
26	4.0	5.6	0.0	0.0	2.2	2.2	2.8	0.0	0	0	17.6	00.0	00.0	0.0	1.1	0.0	8.8	22.5	15.8	0.0	36.6	-	
27	0.2	0.0	0.1	0.4	0.0	2.8	7.7	0.0	0.3	0.3	14.8	00.0	00.3	0.0	3.1	0.0	24.6	0.0	7.2	0.0	-	-	-
28	1.6	23.0	0.0	0.0	6.2	5.6	10.2	0.0	3.4	3.4	26.4	00.0	03.4	0.0	18.0	1.8	2.8	0.0	0.0	5.0	5.4	-	
29	0.0	32																					

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
7月1日	7.6	26.2	0.0	17.2	10.2	0.0	15.3	29.4	23.5	23.5	0.4	0.02	23.5	18.4	2.6	0.0	0.0	0.0	0.0	0.0	7.8	-	-
2	1.0	4.6	5.8	2.5	3.8	0.7	7.2	0.0	7.2	0.0	0.1	12.9	07.2	19.2	10.2	0.0	16.9	0.0	2.8	21.6	40.0	-	-
3	9.0	2.8	0.0	0.0	0.5	9.9	1.4	0.0	0	0	0	0.00	00.0	0.0	10.3	0.0	0.0	0.0	0.0	2.5	13.4	-	-
4	0.0	0.0	2.4	17.8	1.3	0.0	9.6	46.8	4.6	4.6	34.4	0.00	04.6	101.8	10.5	0.0	9.8	10.2	0.0	14.5	11.0	-	-
5	42.4	0.0	12.6	64.8	12.3	4.3	0.0	55.0	1.4	1.4	0	0.11	01.4	0.0	20.1	1.2	1.6	1.6	0.0	7.4	-	-	-
6	1.0	4.6	6.4	8.0	0.0	0.3	7.0	8.9	0	0	0	0.00	00.0	0.0	0.0	0.0	35.4	0.0	2.2	0.0	-	60.3	-
7	1.0	29.3	21.0	0.0	0.0	23.7	0.0	1.2	0	0	0	0.00	0.0	1.6	21.8	10.8	29.9	0.0	0.0	0.0	46.6	31.9	-
8	3.6	0.8	0.0	0.0	5.0	0.0	0.0	0.0	5.2	8.2	0.2	0.00	05.2	0.0	13.4	22.0	20.2	12.7	0.0	8.0	-	72.3	-
9	4.2	19.4	2.2	0.0	1.4	2.2	0.0	0.8	2.5	2.5	0	0.00	02.5	0.0	31.2	16.2	8.7	1.3	0.0	0.0	-	33.9	-
10	0.1	0.0	7.6	0.0	15.2	0.0	22.3	22.2	0	0	0	0.00	00.0	0.0	14.4	0.0	0.0	5.6	0.0	0.0	-	20.2	-
11	8.2	0.0	0.0	0.0	0.0	3.4	23.2	0.7	0	0	0	0.00	00.0	76.3	9.8	0.0	26.9	0.0	0.0	0.0	1.5	5.4	-
12	0.1	0.6	0.0	6.5	1.5	2.2	0.0	1.8	0.1	0.1	0	0.12	00.1	19.6	7.5	0.0	2.4	0.0	17.2	0.0	24.3	-	-
13	0.4	13.6	0.0	0.0	0.0	3.4	11.8	5.8	7.9	7.9	0	13.8	07.9	32.4	5.9	9.3	49.1	10.2	7.7	0.0	83.8	-	-
14	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.1	0	18.6	00.1	0.0	10.4	28.2	0.0	0.0	0.0	0.0	2.0	9.6	-
15	1.0	0.0	0.0	0.0	0.0	0.9	0.0	4.4	4.4	4.4	0	0.00	04.4	0.0	16.4	6.3	1.3	0.0	0.0	0.0	-	31.3	-
16	43.8	10.9	4.6	0.0	0.0	6.7	2.6	1.0	26.4	26.4	6.4	0.00	26.4	0.0	4.9	0.2	0.0	3.4	1.2	0.0	-	-	-
17	9.0	0.0	0.0	0.0	0.8	0.0	0.7	8.4	0.3	0.3	0	0.00	00.3	2.5	19.2	0.0	0.0	3.5	46.1	-	-	-	-
18	0.4	0.0	6.8	0.0	2.4	0.4	0.5	0.0	8.2	8.2	0	0.00	08.2	0.0	10.2	0.0	7.6	15.3	11.5	0.0	-	21.2	-
19	15.2	0.0	5.6	0.0	0.0	7.4	0.0	0.0	0.4	0.4	1.8	01.9	00.4	16.4	49.8	5.3	0.0	0.0	1.3	7.1	6.5	4.2	-
20	1.4	7.8	0.0	0.0	35.3	0.0	0.2	0.0	34.8	34.8	41.8	00.9	34.8	15.8	3.5	6.3	0.0	0.0	0.0	0.0	39.8	-	-
21	0.0	27.0	0.0	0.0	11.0	3.4	24.3	0.0	0	0	0	19.2	00.0	10.4	3.2	17.4	0.0	12.6	2.1	0.0	1.7	-	-
22	30.2	1.8	0.0	10.8	49.7	0.0	39.2	0.0	0	0	16.6	01.0	00.0	13.6	8.2	0.0	0.0	4.3	0.0	0.0	6.6	-	-
23	0.1	0.9	0.5	35.4	0.6	19.6	6.1	0.0	0.1	0.1	35.6	23.2	00.1	6.0	3.8	0.0	0.0	3.6	0.0	0.0	12.3	1.6	-
24	0.4	0.0	0.0	15.9	14.2	6.2	0.6	0.0	0.2	0.2	9.7	03.6	00.2	4.4	0.0	0.0	5.9	4.1	20.1	21.0	2.4	-	-
25	0.1	0.0	0.0	26.8	0.6	8.4	15.5	0.0	3.4	3.4	11.2	01.4	03.4	0.0	0.0	0.0	5.8	1.1	2.5	1.5	1.2	-	-
26	36.4	21.4	0.0	1.3	6.0	6.2	2.9	0.8	0.8	0.8	15.2	00.8	00.8	10.4	5.7	17.1	0.0	15.8	23.0	0.4	1.6	-	-
27	12.4	0.0	17.6	0.0	0.4	0.0	3.2	0.0	0.4	0.4	12.2	00.0	00.4	2.4	4.4	0.0	41.7	0.0	0.0	0.5	12.3	9.6	-
28	18.0	0.0	32.2	27.6	4.0	1.2	0.0	0.0	0.3	0.3	22.5	48.4	00.3	0.0	34.6	12.3	0.0	0.0	11.5	23.9	-	-	-
29	4.8	0.0	0.0	0.4	2.4	0.4	7.6	1.1	0	0	0	07.0	00.0	8.0	2.2	0.0	0.0	0.0	18.5	0.0	-	-	-
30	0.0	0.0	0.0	0.1	89.4	8.5	8.4	5.4	8.8	8.8	36.3	28.2	08.8	0.0	10.1	11.1	0.0	8.4	9.6	0.0	-	-	-
31	0.0	0.0	0.0	6.3	0.5	13.8	64.2	36.4	0	0	26.6	11.2	00.0	0.0	4.1	0.0	0.0	0.0	0.0	2.0	34.0	-	-
Total	251.9	171.7	125.3	241.2	269.5	132.2	274.2	230.1	141.0	141.0	271.0	194.8	141.9	353.2	347.2	161.7	262.3	110.0	124.2	144.1	342.7	301.5	215.1
N	7.0	7.0	4.0	8.0	8.0	3.0	8.0	5.0	3.0	3.0	10.0	7.0	3.0	11.0	15.0	8.0	7.0	8.0	5.0	5.0	11.0	7.0	8.0

Siemreap Daily Rainfall-7

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
8月1日	0.0	34.2	0.0	0.0	2.4	2.2	3.2	12.0	1.3	1.3	46.4	18.0	01.3	0.0	0.4	0.0	0.0	0.0	0.0	2.3	34.0	-	-
2	0.0	0.0	7.4	0.0	0.2	19.4	0.1	0.0	15.8	15.8	0.1	00.4	15.8	0.0	6.8	50.4	0.0	0.0	0.0	0.0	4.2	-	-
3	0.0	0.0	14.4	67.0	0.0	0.0	1.4	4.6	8.3	8.3	10.8	00.0	08.3	0.0	11.2	4.2	4.3	2.2	0.0	0.0	24.6	-	-
4	0.0	0.0	18.0	2.0	1.1	0.0	14.5	0.4	0.6	0.6	17.7	00.0	00.6	2.0	2.1	48.1	24.0	0.0	6.3	0.0	-	3.8	-
5	0.3	17.6	5.8	4.0	0.8	0.0	18.5	2.4	2.4	2.8	0.00	02.4	0.0	12.3	8.7	16.3	0.0	0.0	0.0	13.5	7.0	-	-
6	5.2	3.4	0.0	1.1	0.0	0.1	0.0	2.8	0.1	0.1	2.2	37.2	00.1	44.8	0.0	7.7	3.7	6.2	9.8	1.0	139.5	2.0	-
7	5.0	2.2	16.8	8.0	84.6	0.0	0.0	0.3	0	0	0	26.8	00.0	3.8	0.0	48.3	10.9	0.0	52.0	0.0	2.0	-	-
8	2.6	11.0	14.0	4.2	4.2	19.8	2.0	0.0	1	1	14	10.0	01.0	4.5	0.0	43.8	0.0	0.0	7.7	0.0	7.6	-	-
9	0.0	41.6	20.2	0.8	12.5	3.8	2.6	4.0	0	0	8.5	14.2	00.0	0.0	10.1	19.6	0.0	6.3	1.2	0.0	22.0	-	-
10	0.0	44.2	21.6	0.4	4.0	1.0	0.0	1.8	2.6	2.6	23.2	02.8	02.6	0.0	4.8	-	0.0	34.6	3.7	0.5	44.7	-	-
11	0.0	15.7	0.8	0.0	16.0	1.8	0.0	2.1	9.4	9.4	23.6	02.6	09.4	3.0	0.0	2.6	0.0	0.0	0.0	16.0	4.1	-	-
12	0.0	0.0	60.0	24.6	0.4	0.1	0.6	14.8	30	30	11.6	04.6	30.0	0.0	0.0	3.3	3.3	0.0	3.9	36.0	12.7	-	-
13	0.4	0.0	24.6	6.6	0.0	16.8	9.5	0.0	2.9	2.9	0	00.2	02.9	0.0	0.0	2.9	2.4	0.0	0.0	0.6	-	-	-
14	0.0	23.2	32.6	0.0	0.0	0.0	23.5	0.0	0	0	19.8	04.6	00.0	1.7	0.0	0.0	0.0	12.7	6.1	0.5	32.5	-	-
15	0.0	41.2	9.4	0.0	0.0	0.1	7.1	19.4	0	0	0	06.0	00.0	24.4	0.0	1.6	0.0	0.0	2.3	15.0	25.4	-	-
16	0.0	32.3	1.3	4.1	0.0	3.8	0.0	9.1	2.8	2.8	24.2	00.2	02.8	14.6	0.0	0.0	17.7	0.0	0.0	0.7	-	-	-
17	0.0	3.9	11.3	0.0	3.4	0.0	40.8	0.0	0	0	1	00.0	00.0	0.0	0.0	25.7	0.0	0.0	8.1	0.0	45.0	-	-
18	0.6	18.4	12.3	6.9	82.4	0.0	0.0	0.0	6.3	6.3	0.2	01.2	06.3	0.0	0.0	0.3	0.0	39.2	0.0	0.0	5.5	-	-
19	0.0	19.8	2.5	12.7	9.0	0.0	0.0	0.0	0	0	19	00.0	00.0	3.4	0.0	2.6	4.3	2.1	0.0	0.0	0.8	-	-
20	0.0	50.6	18.6	3.7	6.8	7.0	0.0	7.4	17.5	18.1	0.8	00.0	18.1	0.4	0.2	0.0	0.0	7.5	0.0	97.7	4.5	2.0	-
21	24.2	11.3	30.6	0.3	0.0	32.0	2.6	2.2	0	0	0	00.0	00.0	1.6	0.0	0.0	0.0	0.0	21.2	5.5	57.3	-	-
22	8.8	0.0	1.5	0.6	0.0	0.1	0.1	0.0	8.7	8.7	1.7	00.0	08.7	19.7	19.5	26.5	8.5	3.2	0.0	0.0	0.6	-	-
23	9.2	26.5	1.0	14.4	0.0	0.0	2.2	0.0	0	0	14.8	00.0	00.0	8.4	0.0	0.0	3.2	2.6	0.0	21.5	-	-	-
24	6.8	9.5	0.0	13.2	0.0	0.0	5.0	7.7	0	0	9.6	08.0	00.0	8.2	0.0	0.0	5.2	10.8	0.0	23.5	-	-	-
25	6.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0	0	0	16.4	00.0	5.3	19.5	4.6	26.4	48.3	0.5	42.5	-	2.4	-
26	3.8	0.8	0.0	0.0	0.3	0.0	1.5	0.0	6.6	6.6	0	21.4	06.6	0.0	12.3	28.9	3.7	36.6	1.8	0.5	0.5	30.4	-

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average	
9月1日	0.0	0.0	0.2	1.2	1.8	3.6	1.1	0.6	0.0	27.2	0.0	4.5	0.9	0.0	1.5	0.8	2.4	1.5	3.4	-	5.8	26.0		
2	0.0	2.7	0.0	0.0	4.8	5.7	6.2	29.8	0.0	20.8	12.2	0.2	9.8	0.0	0.0	4.9	1.8	-	42.6	4.8	31.8	0.4		
3	2.8	0.3	0.0	2.1	0.0	23.0	0.0	16.1	3.6	6.7	44.3	4.5	14.3	0.0	0.0	34.0	-	69.1	1.5	9.2	-	1.2		
4	0.0	8.8	0.0	0.0	5.0	0.2	0.0	0.2	0.0	6.6	0.0	0.0	0.0	0.0	21.6	0.4	49.4	5.6	0.0	2.0	-	-		
5	9.5	0.0	0.8	5.6	19.6	0.0	0.8	0.0	18.8	0.5	34.8	2.0	4.6	0.0	0.8	0.0	-	-	19.2	0.4	-	-	6.7	
6	0.5	1.2	0.0	0.4	24.0	32.8	0.0	0.0	7.4	4.2	0.6	7.6	0.0	0.0	0.3	1.2	-	-	0.0	-	0.3	17.8		
7	0.0	0.0	0.0	0.2	0.0	4.0	0.0	0.0	32.6	5.0	0.0	10.2	0.3	0.0	0.0	28.2	8.5	17.6	0.0	2.4	0.8	34.4		
8	6.1	2.0	0.0	23.6	0.0	12.5	0.0	0.0	5.0	0.3	0.0	0.0	0.0	0.0	43.0	1.8	-	3.6	24.6	-	-	-		
9	0.0	12.0	0.0	0.5	1.3	0.0	0.0	0.4	38.5	57.2	8.6	65.2	0.0	0.0	13.0	18.8	11.6	5.1	6.6	-	-	-		
10	0.0	0.3	0.0	1.0	0.0	17.8	0.0	0.0	32.4	8.6	0.6	0.3	2.4	0.0	16.2	0.4	26.4	2.4	93.8	-	21.6	2.6		
11	0.0	13.6	1.4	0.0	36.4	17.8	1.4	10.0	2.0	2.2	10.0	3.7	24.6	0.0	1.2	19.6	9.7	2.2	15.0	2.2	5.2	0.5		
12	4.4	0.0	50.4	0.0	26.2	1.4	50.4	13.6	0.7	7.2	0.0	2.8	2.0	0.0	0.4	9.0	11.8	-	4.3	1.0	-	4.5		
13	24.7	59.6	1.8	0.8	5.6	1.9	1.8	0.0	0.6	10.2	0.0	0.0	0.0	0.0	10.2	-	-	24.8	42.0	79.3	26.1	-		
14	3.6	0.0	63.5	0.0	6.2	1.0	0.0	11.8	10.0	42.2	48.6	0.0	13.6	7.8	0.0	0.0	1.5	4.5	4.8	12.2	6.4	36.0		
15	0.0	5.7	16.1	2.0	0.6	0.0	0.0	17.0	3.3	11.8	16.9	0.0	16.6	0.0	0.6	5.9	46.0	-	0.0	21.2	1.6	13.1		
16	0.6	4.2	0.0	5.0	1.1	0.0	16.1	0.0	1.0	0.0	8.0	22.3	0.7	0.0	7.8	14.6	0.2	11.5	0.0	15.8	-	0.6		
17	0.0	0.0	0.3	24.2	0.0	0.0	0.3	1.2	0.0	0.0	10.8	0.6	0.0	43.2	1.2	14.5	29.5	0.1	0.4	8.6	12.2	-		
18	1.8	14.8	18.6	13.5	1.7	0.3	18.6	0.0	2.6	33.3	17.7	0.0	0.0	0.0	21.5	0.0	1.6	10.8	0.0	0.2	22.8	42.8		
19	3.2	0.0	51.0	0.5	0.3	6.0	51.0	3.2	0.0	0.0	0.0	5.8	18.4	0.0	0.0	0.0	-	-	0.0	-	12.4	10.8		
20	35.9	0.0	0.4	40.0	5.4	9.2	0.8	15.4	0.6	0.0	0.0	46.0	0.0	0.0	18.8	0.0	8.6	16.1	0.6	4.4	6.5	4.8		
21	5.3	1.8	0.0	0.0	4.2	67.9	0.0	8.6	0.0	11.4	0.0	3.8	43.7	0.0	0.2	6.4	20.0	1.5	38.6	22.6	-	-		
22	6.0	0.0	0.0	3.4	0.8	19.6	0.0	0.0	3.8	36.8	0.0	0.8	3.6	0.0	0.0	2.2	2.8	49.0	19.2	43.8	2.5	6.8		
23	0.7	33.3	2.4	87.0	0.0	0.4	2.4	0.0	42.0	1.0	1.6	9.5	1.2	0.0	0.0	4.2	9.6	15.4	7.0	19.6	-	7.3		
24	0.0	5.0	0.0	0.0	44.0	1.0	0.0	0.0	3.0	0.8	36.0	0.6	4.0	0.0	0.0	0.0	7.6	1.4	37.6	-	1.0	4.2		
25	0.0	29.0	2.9	21.0	3.2	9.9	2.9	0.0	0.4	0.2	22.3	0.0	10.6	0.0	46.1	12.6	-	-	0.0	0.2	40.5	0.8		
26	5.0	0.0	26.8	10.3	4.4	8.8	26.8	0.0	52.0	1.5	0.0	6.8	78.0	0.0	0.0	12.6	-	-	0.0	0.0	11.8	-		
27	0.0	1.4	39.7	9.2	6.8	0.4	39.7	1.0	10.0	0.0	20.3	30.6	3.9	0.0	0.0	5.6	0.8	4.2	0.0	59.5	43.2	17.2		
28	1.0	28.0	5.3	19.6	7.8	7.2	5.3	7.7	0.2	3.8	1.4	16.6	11.0	0.0	82.0	1.8	79.0	82.0	0.0	0.6	2.2	-		
29	0.8	20.0	0.0	26.3	22.9	2.2	0.0	11.4	15.3	0.9	5.0	0.0	1.6	0.0	0.5	48.5	7.2	0.3	4.8	-	-	1.6		
30	12.8	10.3	0.0	1.1	3.1	43.8	2.6	7.1	4.4	0.0	24.6	0.0	0.5	0.0	0.0	8.2	21.6	0.0	1.6	3.6	1.0	-		
Total	124.7	254.0	281.6	298.5	237.2	298.4	228.2	155.1	290.2	300.2	324.3	244.4	266.1	51.0	274.7	245.6	356.8	326.3	348.8	274.3	311.5	267.2	261.8	
N	3.0	9.0	7.0	9.0	6.0	8.0	6.0	8.0	9.0	9.0	12.0	6.0	9.0	1.0	8.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	7.8	

Phnom Penh Daily Rainfall -9

Phnom Penh Daily Rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Monthly Average
10月1日	12.2	21.5	2.6	0.4	24.8	3.4	0.0	21.5	0.0	2.6	41.0	0.0	1.5	0.0	0.0	5.4	-	-	33.1	1.6	8.0	19.2	
2	3.5	8.5	2.3	20.8	0.0	0.0	2.3	11.6	28.0	22.8	59.0	35.6	4.2	0.0	0.0	1.3	-	1.4	45.8	-	5.8	45.8	
3	0.2	20.0	1.9	15.4	15.8	0.0	1.9	6.4	15.7	0.0	0.1	0.2	0.2	0.0	0.0	3.7	7.0	7.6	6.3	15.0	0.8	-	
4	0.0	14.0	6.4	14.4	7.4	86.5	6.4	3.4	0.0	0.0	15.2	35.4	5.0	0.0	0.0	0.0	-	3.4	8.2	-	58.4	28.8	
5	53.0	19.0	2.2	1.2	26.0	0.0	2.2	0.8	0.0	0.5	5.2	2.6	5.8	0.0	19.2	0.5	31.0	-	3.0	-	8.2	42.8	
6	2.8	28.8	0.7	4.6	74.0	0.0	0.7	5.6	15.3	1.4	0.0	27.7	58.8	33.2	8.4	0.0	65.8	-	13.9	12.0	1.0	1.2	
7	0.8	2.0	0.0	1.2	0.0	0.0	0.0	9.0	0.0	1.4	13.9	0.0	4.8	36.0	0.0	2.3	19.3	-	0.0	10.0	19.6	1.2	
8	1.0	25.0	0.8	0.4	10.0	0.8	0.8	0.0	2.3	0.0	0.0	37.0	1.8	0.0	3.6	39.3	38.7	50.3	24.4	4.0	0.8	-	
9	4.8	42.4	12.4	0.0	0.0	25.0	12.4	0.4	1.2	0.0	0.0	1.8	0.2	0.0	14.3	0.8	59.4	-	0.0	0.2	82.0	0.8	
10	62.0	2.0	1.0	2.9	0.9	0.0	1.0	0.7	44.6	7.8	73.0	37.6	6.8	0.0	0.0	0.4	9.5	-	0.0	-	21.6	5.4	
11	41.6	18.0	21.9	0.0	1.3	0.0	21.9	1.3	0.0	6.7	94.4	17.2	0.0	0.2	0.0	0.4	10.7	6.2	0.0	1.5	64.2	0.4	
12	28.3	3.4	10.0	0.0	0.3	2.0	0.0	7.0	0.0	1.6	11.3	3.2	0.0	5.0	24.4	6.0	4.2	-	57.0	34.6	1.0	-	
13	4.2	7.6	2.2	5.8	0.0	12.8	10.0	21.6	0.5	3.8	1.2	0.0	0.0	0.0	0.0	0.8	-	0.7	7.8	5.0	45.0	24.0	
14	14.2	2.6	0.0	47.8	6.0	8.5	2.8	5.1	0.2	0.0	17.2	0.8	4.2	21.5	0.0	44.8	4.0	5.6	2.7	-	0.8	0.6	
15	0.8	0.0	5.0	9.2	9.0	27.6	0.0	4.8	1.0	7.7	8.1	8.2	2.2	4.4	0.0	0.6	0.2	0.3	0.0	11.0	19.8	4.0	
16	0.0	0.0	79.3	5.8	26.2	0.0	5.0	57.4	0.0	6.6	0.0	0.0	0.0	15.0	0.0	0.0	0.4	4.0	0.0	-	3.4	19.4	
17	4.2	15.5	5.6	11.2	0.0	23.0	79.3	5.3	0.4	4.0	9.3	4.0	0.0	13.0	0.0	0.0	-	29.5	3.6	-	6.8	4.2	
18	0.0	6.0	16.4	0.0	0.0	0.0	5.6	0.0	21.0	10.8	4.0	7.8	0.0	0.0	40.7	0.0	46.2	0.4	0.0	43.0	14.6	-	
19	2.0	3.2	0.0	1.0	0.0	4.8	16.4	0.0	28.5	2.0	7.6	42.4	0.0	0.0	17.4	67.5	14.2	0.8	29.8	7.8	37.6	0.1	
20	83.2	0.0	0.0	6.1	0.0	4.9	0.0	0.0	0.0	0.8	11.8	0.0	0.0	3.6	2.8	13.5	-	0.4	-	-	102.6	-	
21	0.0	17.8	0.8	0.2	0.0	2.0	0.0	0.0	20.3	0.0	0.0	0.0	0.0	7.8	14.0	0.0	0.6	-	0.5	-	38.2	1.5	
22	13.2	79.8	17.6	5.5	0.0	43.4	0.8	22.0	8.4	3.0	0.0	12.8	10.2	55.7	24.0	0.0	10.8	2.9	0.0	-	-	1.2	
23	1.0	16.2	0.0	6.2	0.0	29.2	17.6	0.0	16.4	16.4	0.0	1.6	17.1	8.3	0.0	0.4	-	21.8	4.4	-	-	4.8	
24	0.0	21.2	0.0	14.2	0.0	13.8	0.0	0.0	7.6	0.3	15.0	0.8	0.0	0.0	0.0	0.0	-	0.4	5.0	0.7	-	-	
25	52.8	0.6	0.0	1.5	0.0	31.0	0.0	3.0	2.0	8.8	4.7	0.0	0.0	3.0	34.5	2.2	23.7	3.0	15.6	-	-	-	
26	1.5	13.8	0.0	0.0	0.0	18.4	0.0	24.8	1.0	0.0	3.5	15.6	0.0	0.0	11.2	5.0	21.0	0.8	0.0	14.8	-	-	
27	1.6	0.0	0.0	0.0	0.0	38.0	0.0	0.4	0.2	0.0	0.0	7.8	0.0	8.8	0.0	0.8	20.0	-	1.0	0.6	-	4.5	
28	33.2	5.7	3.8	0.0	0.0	0.0	3.8	0.0	1.8	0.0	0.7	0.0	2.6	0.0	0.0	0.0	26.4	-	0.0	4.2	-	-	
29	12.4	14.0	0.0</																				

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month	
#####	0.0	0.3	7.4	0.0	0.0	0.0	0.0	0.0	26	0	0.0	00.0	00.0	0.0	0.0	1.0	9.8	0.0	0.0	0.0	12.0	8.5		
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0.0	02.2	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	-	-	
3	0.0	1.4	26	0.0	0.0	0.0	0.0	0.0	11.4	1.4	0.0	00.0	01.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	-	-	
4	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	3.2	3.2	0.0	00.0	03.2	0.0	0.0	0.0	0.0	10.0	0.0	0.0	-	-		
5	0.0	4.2	0.0	0.0	0.5	21.6	0.0	0.0	24.5	24.5	0.0	00.0	24.5	1.6	0.0	11.5	1.6	3.2	0.0	0.0	-	0.7		
6	0.0	8.4	0.0	0.0	6.7	1.6	0.0	0.0	0	5.4	0.0	01.1	05.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0	-	7.4		
7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	5.4	0.1	0.0	00.0	00.1	8.6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	2.0	9.5	
8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	9.8	0.0	24.8	09.8	0.0	0.0	18.4	3.8	3.7	0.0	0.0	-	16.9		
9	0.0	0.0	0.0	0.0	0.0	11.7	0.0	0.0	9.8	0	0.0	00.3	00.0	2.6	0.0	4.2	1.9	0.0	0.0	0.0	-	-		
10	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0	0	0.0	0.0	00.0	00.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	-	5.4		
11	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.7	0	0	0.0	00.0	00.0	0.0	0.0	0.0	5.5	0.0	0.0	1.2	3.0	-		
12	0.0	12.8	1.4	1.8	0.0	0.0	0.0	3.5	0	0	0.0	00.0	00.0	32.2	0.0	0.0	0.0	6.4	0.0	1.3	1.0	-		
13	0.0	0.6	0.0	0.1	0.0	0.0	0.0	6.2	0	0	0.0	00.0	00.0	5.1	0.0	8.2	0.0	0.0	0.0	0.0	-	3.5		
14	0.0	0.0	0.0	0.0	0.0	0.0	11.2	0	0	0.0	0.0	00.0	00.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	-	-		
15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	35.4	0.0	00.0	04.8	5.5	0.0	0.0	0.0	4.8	0.0	0.0	-	4.7		
16	0.3	0.0	0.0	0.0	0.0	34.2	0.0	0.0	16	16	0.6	00.0	16.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	-	23.5		
17	5.0	0.0	23.5	0.0	0.0	8.4	0.0	0.0	1.6	1.6	2	00.0	01.6	3.1	0.0	0.0	38.8	0.0	0.0	0.0	-	3.5		
18	0.0	0.0	0.2	0.0	0.0	0.0	0.0	3.7	1	1	7.1	00.0	01.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	-	18.6		
19	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	18.1	14.4	0.0	-	-		
20	1.6	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	-	5.7		
21	0.0	0.0	27.3	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	-		
22	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	9.5	8.8	8.8	0.0	0.0	-	-		
23	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.1	0.1	3.2	0.0	00.0	00.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		
24	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.1	0.1	0	0.0	00.0	00.1	0.0	0.0	0.0	0.0	8.7	0.0	0.0	-	-		
25	7.3	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-	-		
26	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0	0	0	01.4	00.0	0.0	0.0	0.0	0.0	0.0	1.4	2.1	0.0	-	-	
27	0.2	0.0	4.8	0.0	0.8	1.9	0.0	0.0	0	0	0	00.0	00.0	1.2	0.0	0.0	0.0	0.0	11.6	0.0	-	-		
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	22.8	0.0	0.0	0.0	0.0	0.0	0.0	-	-		
29	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	1.0	3.5	0.2	-	4.2		
30	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	4.6	00.0	00.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	-	-		
Total	14.9	27.7	81.7	3.9	26.3	90.0	8.1	28.7	92.6	68.0	52.9	29.8	68.0	108.4	0.0	52.8	99.9	93.7	32.3	27.4	33.2	112.1	52.4	
N	0.0	1.0	2.0	0.0	1.0	3.0	0.0	1.0	3.0	2.0	1.0	1.0	2.0	4.0	0.0	2.0	2.0	4.0	2.0	1.0	1.0	3.0	1.8	

Siemreap Daily Rainfall-11

Siemreap daily rainfall (mm/day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average in month
#####	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
2	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
3	0.0	0.0	0.0	0.0	0.0	0.6	1.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
4	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
5	0.0	0.0	0.0	0.0	0.0	14.5	8.8	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0	0	18.1	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
7	0.8	0.0	0.0	0.0	0.0	1.0	0.3	0	0	0	0	00.4	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	-	-
8	3.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0	0	0	04.2	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	-	-	
11	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
12	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	-	
13	4.2	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	-	-	
14	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0	0	0	00.0	00.0	9.8	0.0	0.0	0.0	4.3	0.0	0.0	2.9	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	18.2	0.0	0.0	23.7	0.0	0.0	0.0	1.5	-	
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.3	0.0	0.0	18.2	0.0	0.0	0.0	-	-	
17	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
20	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
21	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
22	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0	0	0	00.0	00.0	0.0	0.0	0.0	0.0						

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
3月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
3	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
5	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
8	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
10	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
16	3.3	17.5	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	4.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
17	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0	4.0	0	25.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	25.8	0	38.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
19	0.0	2.2	0.0	0.0	0.0	0.0	0.0	1.0	0	38.2	0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
20	0.0	4.8	0.0	0.0	0.0	0.0	3.8	0	0.0	0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
21	0.0	0.0	0.0	0.0	0.0	12.2	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
23	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0	0.0	0	27.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
24	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0	27.2	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
25	0.0	0.9	0.4	0.4	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
28	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
29	0.0	0.0	3.8	3.8	0.0	7.1	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	18.0	18.0	0.5	0.0	-	-	-	
30	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
Total	3.3	51.3	4.4	4.4	0.0	13.7	7.3	14.2	11.9	95.2	0.0	95.2	40.1	8.0	0.0	18.0	18.0	153.0	26.5	37.0	0.0	0.0	27.3
N	0.0	3.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	3.0	0.0	3.0	1.0	0.0	0.0	1.0	1.0	4.0	1.0	2.0	0.0	0.0	0.0

Stung Treng Daily Rainfall 3

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
4月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0	0.0	0.2	0.0	69.5	0.0	0.0	22.0	0.0	13.5	-	-	
2	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	28	0.0	0	0.2	4.5	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
3	0.0	8.7	0.0	0.0	0.0	0.0	0.5	0.0	5.5	0.2	0	12.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	-	-	-	16.0
4	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0	12.0	0	1.3	0.0	0.0	34.5	0.0	0.0	0.0	0.0	-	-	-	5.8
5	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0	1.3	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0	0.0	17.5	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
7	0.0	0.0	0.0	0.0	0.0	25.5	0.0	0	0.0	0	0.0	0.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.3
8	0.0	0.0	0.0	0.0	68.2	0.0	0.0	0.0	0	0.0	0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	-	-	-	71.0
9	2.3	0.0	0.0	0.0	1.5	0.0	1.3	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
10	125.3	0.0	0.0	0.0	0.0	0.0	0.2	0	0.0	0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	-	-	-	27.5
11	84.7	0.0	8.8	8.8	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	-	-	-	
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	5.0
13	35.6	0.0	0.0	0.0	0.0	0.4	0.0	2.0	0	0.0	0	8.5	0.0	0.0	140.5	0.0	0.0	0.0	0.0	-	-	-	6.0
14	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0	8.5	0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	-	-	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0	-	-	-	
16	30.3	22.2	0.0	0.0	0.0	2.2	0.0	5.5	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
17	39.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	5.0	13.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.5
18	7.5	0.0	0.0	1.0	18.4	0.0	0.0	0.0	0	13.5	0.0	8.6	0.0	0.0	10.5	0.0	0.0	0.0	0.0	-	-	-	
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	17.4	0	0.0	7.5	17.5	0.0	14.5	14.5	0.0	0.0	-	-	-	
22	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	52.0	0.0	11.0	11.0	0.0	0.0	-	-	-	
23	0.0	0.0	1.2	1.2	0.0	0.0	0.0	8.7	0	0.0	0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	-	-	-	
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Stung Treng Daily Rainfall (mm/Day)

5月1日	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
2	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
3	0.0	0.2	0.0	0.0	12.7	0.0	0.0	25.2	8.3	2.5	0	0.0	0.0	1.5	50.0	0.0	0.0	0.0	0.0	0.0	-	-	
4	0.0	0.0	0.0	0.0	2.9	0.0	0.0	3.8	31.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.5	10.0	-	-	-	
5	12.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0	0.0	0.0	0.0	46.5	48.0	0.0	0.0	0.0	0.0	0.0	0.5	-	-	
6	0.0	0.0	0.0	4.0	0.0	0.0	0.0	41.0	2.1	0.0	0.0	0.0	11.0	0.0	0.0	0.0	36.0	0.0	1.0	-	-	-	
7	0.0	0.0	0.0	0.0	24.2	16.6	0.0	49.7	8.5	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.5	5.0	-	-	-	
8	0.0	0.0	0.0	0.9	0.0	23.1	0.0	3.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0	10.0	-	-	
9	41.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0	0.0	0.0	2.5	0.0	0.0	1.0	0.0	0.0	48.0	0.0	2.5	-	-	
10	0.0	0.0	0.0	0.0	1.8	22.5	5.5	10.3	37	2.5	33.0	69.5	0.0	0.0	16.0	0.0	4.5	26.5	0.0	70.6	-	-	
11	47.5	0.0	0.0	0.0	0.0	0.9	0.5	16.6	0	69.5	0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
12	45.0	7.0	0.0	0.0	0.0	5.0	1.3	97.0	45	5.7	0	0.0	2.5	0.0	0.0	10.0	0.0	0.0	0.0	-	-	1.0	
13	16.5	48.5	0.0	0.0	0.0	0.0	0.0	36.6	36.5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.0	11.0	33.0	-	
14	0.0	65.0	0.0	27.0	0.0	0.0	0.0	4.6	12.5	0.0	0	19.6	1.0	5.0	0.0	0.0	0.0	0.0	0.0	1.0	-	-	
15	0.0	9.9	0.0	0.0	0.0	0.0	0.0	7.5	0.3	19.6	0.0	0.2	41.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	-	17.0	
16	26.3	24.7	0.0	2.0	0.0	0.0	0.0	6.0	37.6	0.2	0	0.0	0.0	0.0	12.0	0.0	3.0	3.0	0.0	45.0	-	-	
17	17.7	18.1	0.0	5.3	7.7	0.0	0.0	7.8	12.5	0.0	0	0.0	17.0	12.5	18.0	0.0	0.0	7.0	8.5	-	-	2.5	
18	9.2	13.5	0.0	0.0	0.0	4.0	51.7	9.2	5	0.0	0	1.0	0.0	0.0	15.5	10.0	0.5	0.0	0.0	-	-	29.0	
19	0.0	8.4	0.0	0.0	0.0	0.0	0.0	20.5	1.0	0	13.0	0.0	27.5	0.0	3.0	0.0	18.0	28.0	-	12.0	-	-	
20	13.2	6.7	0.0	6.2	0.0	0.0	3.3	0.2	7.5	13.0	0	0.2	6.0	0.0	0.0	0.0	0.0	0.0	31.5	-	-	-	
21	16.5	11.7	0.0	2.0	0.0	0.3	5.5	0.0	19	0.2	12.5	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	23.5	
22	10.3	14.0	0.0	0.0	0.0	3.7	0.0	0.0	12.1	24.0	7.0	8.6	0.0	9.2	0.0	0.0	27.0	0.0	40.5	51.0	-	-	
23	21.3	0.0	0.0	20.8	41.8	0.0	0.0	0.0	7.1	8.5	0	18.0	7.5	0.0	0.0	4.0	0.0	0.0	3.0	14.5	10.0	-	
24	15.1	2.9	0.0	5.2	0.0	0.0	2.3	0.0	0	18.0	0	12.3	4.7	13.0	1.0	9.5	6.5	15.5	14.0	-	-	75.0	
25	0.0	24.9	0.0	11.5	11.4	3.5	0.0	0.0	0	12.3	10.5	3.0	3.7	0.0	0.0	3.0	19.0	8.0	0.0	-	50.0	20.0	
26	45.5	7.0	0.0	0.0	0.0	10.3	0.0	0.0	0	3.0	5.5	5.8	23.7	0.0	0.0	12.5	43.0	15.0	0.0	-	4.0	-	
27	0.0	1.5	0.0	1.0	0.0	0.0	0.0	0.0	0	5.8	0	21.5	0.0	0.0	3.0	0.0	8.0	8.0	6.0	37.0	-	2.0	
28	0.0	2.9	0.0	11.4	2.9	0.0	0.0	8.2	0.2	21.5	22.5	0.0	27.0	50.0	0.0	0.0	11.0	3.5	0.0	17.0	-	-	
29	0.0	1.3	0.0	2.6	0.0	0.0	0.0	41.0	0.1	0.0	0.0	0.2	5.5	35.0	0.0	0.0	0.0	3.0	0.0	2.5	17.0	-	
30	9.5	0.4	0.0	0.0	0.0	3.8	19.3	0.0	35.2	0.2	0	0.0	0.0	0.0	12.0	0.0	31.5	15.0	14.0	-	-	-	
31	3.0	0.0	0.0	0.0	35.5	0.0	19.7	0.0	0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0	3.0	-	-	-	
Total	352.1	300.5	0.2	100.1	140.9	95.4	109.1	378.9	340.6	207.5	96.5	207.5	201.1	199.7	134.2	48.0	194.0	307.5	333.5	260.6	130.5	180.5	196.3
N	13.0	9.0	0.0	4.0	5.0	4.0	3.0	9.0	9.0	7.0	4.0	7.0	6.0	6.0	6.0	3.0	6.0	7.0	8.0	7.0	4.0	6.0	6.0

Stung Treng Daily Rainfall 5

Stung Treng Daily Rainfall (mm/Day)

6月1日	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
2	18.3	1.0	0.0	8.2	9.0	7.6	0.0	25.0	55.1	6.0	3.5	23.5	0.0	10.0	0.0	15.0	0.0	7.0	16.5	-	-	-	
3	4.2	0.0	0.0	12.1	61.8	1.6	0.0	0.0	0.6	23.5	46.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	6.5	-	-	-	
4	31.5	0.0	0.0	0.1	52.2	0.1	0.0	0.0	0	4.7	0	0.0	42.0	5.0	0.0	0.0	0.0	0.0	0.0	-	-	-	
5	0.0	0.0	0.0	10.9	0.0	0.4	0.0	0.0	0	0.0	0.5	0.0	0.0	0.0	0.0	0.5	58.5	14.0	1.5	-	-	-	
6	0.0	2.1	4.0	4.5	3.9	0.0	0.0	0.0	0	0.0	6.0	0.0	0.0	0.0	8.5	36.5	0.0	1.0	46.5	-	-	-	
7	0.0	7.3	0.0	0.2	0.0	5.6	0.0	0.0	0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	1.0	-	-	
8	0.0	0.0	0.0	47.0	0.0	35.2	0.0	2.6	9.5	0.0	2.8	1.0	0.0	0.0	0.0	20.0	5.5	16.0	2.0	8.5	-	14.0	
9	0.0	0.0	0.0	18.2	0.0	8.7	0.0	0.0	0	2.8	0	48.8	3.5	0.0	32.0	0.0	0.0	1.0	20.0	-	-	23.0	
10	0.0	6.1	0.0	23.4	83.6	0.0	0.0	0.0	0	48.8	0	0.0	0.0	32.5	35.0	0.0	6.0	50.0	0.0	1.5	6.5	1.5	
11	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.3	0.0	0	0.0	0.0	20.5	1.5	4.0	1.0	21.0	-	-	-	2.5	
12	0.0	4.9	0.0	3.1	38.1	0.0	0.0	5.6	11.8	0.0	0	0.0	0.0	31.5	4.5	0.0	34.0	0.0	0.0	-	-	2.0	
13	0.0	0.0	0.0	0.0	27.9	0.0	0.0	0.0	0	0.0	19.0	0.0	0.0	0.0	9.0	3.5	1.5	2.0	0.0	-	-	56.5	24.0
14	4.3	16.5	27.0	0.0	18.0	0.0	0.0	0.0	10.5	0.0	0.0	4.7	0.0	50.0	0.0	0.0	0.0	0.0	0.0	-	-	4.0	
15	34.2	0.0	0.0	0.3	0.1	34.4	0.0	8.2	4.2	4.7	0.0	24.8	0.0	0.0	1.0	1.0	0.0	0.0	18.0	6.0	17.5	2.5	
16	45.5	15.6	2.0	0.0	0.0	0.0	1.0	0.0	0.5	24.8	0.0	0.0	4.5	0.0	15.5	0.8	2.0	0.0	15.5	12.5	8.0	12.0	
17	56.7	0.0	5.3	0.0	0.0	0.0	20.1	0.0	6	0.0	0.0	1.7	10.5	0.0	17.5	0.0	0.0	0.0	5.5	19.0	1.0	-	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	1.7	0.0	1.5	0.0	33.5	0.0	7.5	0.0	9.0	26.0	0.5	-	-	
19	17.3	0.0	0.0	0.1	1.7	0.0	6.3	0.0	0	1.5	0.0	18.4	0.0	8.5	2.0	0.0	0.0	0.0	10.0	-	-	-	
20	0.0	0.0	6.2	2.8	4.0	0.0	8.5	0.8	0	18.4	0.0	2.2	0.0	43.0	2.5	30.0	23.5	0.0	15.0	-	1.5	-	
21	38.5	39.9	2.0	55.8	0.4	18.1	15.9	0.8	0	2.2	0.0	0.0	0.0	12.0	10.0	11.5	13.0	0.0	0.0	-	-	10.0	
22	27.5	41.0	0.0	27.1	0.0	10.2	0.0	0.0	0	0.0	15.0	0.0	0.0	5.5	80.0	0.0	25.0	2.5	0.0	2.0	-	-	
23	45.2	20.8	20.8	7.1	0.8	40.0	0.3	0.0	0	0.0	0.0	0.0	21.0	14.5	2.0	0.0	56.0	0.0	0.0	-	-	10.0	
24	35.1	3.1	5.2	0.2	0.0	0.0	9.5	0.0	0	0.0	6.5	0.0	0.0	1.5	11.0	100.7	45.5	2.0	15.0	-	27.0	0.5	
25	13.7	5.8	11.5	3.5	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.5	15.0	0.0	17.0	0.0	0.0	-	-	-	
26	64.5	13.5	0.0	0.0	0.0	0.0	8.1	0.0	28.2	0.0	0.2	1.0	5.5	3.0	0.0	2.0	73.0	0.0	3.0	-	-	-	
27	0.0	17.7	1.0	1.5	14.3	30.8	0.8	16.2	5.2	1.0	13.7	0.0	0.0	0.0	0.0	0.0	39.0	0.0	24.0	-	-	-	
28	5.3	9.0	11.4	15.4	0.0	8.5	0.1	8.7	7.8	0.0	0	0.0	60.0	0.0	33.5	0.0	32.5	0.0	0.0	-	2.0	-	
29	0.0	45.1	2.6	0.0	0.0	4.7	8.4	0.0	0	0.0	0	0.0	15.5	2.7	13.0	0.0	13.0	0.0	1.0	-	1.5	-	
30	0.0	2.4	0.0	0.0	0.0	12.2	5.2	0.0	12	0.0	8.5	0.0	30.0	0.0	2.0	0.0	0.0	0.0	0.0	0.5	1.0	15.0	
Total	449.1	251.8	99.9	299.8	305.8	218.8	90.0	87.9	182.0	140													

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021				
7月1日	0.0	4.2	3.0	3.0	0.1	7.4	6.7	39.7	0	0.0	65.2	0.0	20.0	0.0	2.5	0.0	3.0	0.0	3.5	22.0	45.0	-	-			
2	7.1	21.0	8.7	8.7	15.8	4.8	24.1	18.0	3	0.0	0.7	1.0	42.0	0.0	11.5	0.0	1.0	12.0	2.0	15.0	4.5	-	-			
3	8.8	1.5	0.9	0.9	0.0	0.0	2.3	8.3	0	1.0	24	0.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	61.5	-	-			
4	12.1	43.8	20.7	20.7	0.0	0.0	8.5	6.0	1.7	0.0	38.4	38.0	16.0	0.0	3.0	0.0	14.0	15.0	0.0	30.0	-	-	-			
5	32.0	8.1	1.0	1.0	0.0	0.0	3.1	7.5	0	38.0	0	2.0	45.5	0.0	48.0	30.5	45.0	7.5	0.0	17.0	-	-	8.0			
6	0.0	2.3	10.8	10.8	0.0	2.2	7.6	3.4	0	2.0	0	0.0	36.0	100.0	20.0	3.0	7.0	25.0	19.0	-	-	74.5	-			
7	0.0	27.7	2.6	2.6	0.0	27.1	10.4	21.6	0	0.0	0	0.0	0.0	9.5	12.5	30.0	0.0	2.0	58.0	-	-	3.7	14.0			
8	0.0	19.9	9.9	9.9	0.0	12.0	0.0	3.5	28	0.0	0	0.0	1.0	5.5	68.5	30.1	16.0	4.0	0.0	2.0	-	-	1.5			
9	8.0	0.0	22.8	22.8	0.0	4.0	0.0	7.3	0	0.0	0	0.0	0.0	15.0	31.0	22.0	1.5	6.0	32.0	-	-	-	7.0			
10	22.2	0.0	23.4	0.6	0.0	8.9	129.0	2.5	4.7	0.0	0	0.0	1.0	3.0	1.5	0.0	39.0	8.5	28.5	-	-	-	3.0			
11	22.8	0.0	0.0	6.8	0.0	0.0	0.1	31.3	0	0.0	0	0.0	0.0	8.5	0.0	28.5	42.0	5.0	34.0	12.0	-	-	-	6.0		
12	0.0	0.0	3.1	1.2	0.0	8.8	8.5	0.0	0	0.0	0	18.4	0.0	0.0	0.0	0.0	15.0	0.0	1.0	-	-	-	-	66.0		
13	0.0	7.1	0.0	22.7	0.0	0.0	10.5	0.0	10.5	18.4	0.2	52.5	9.5	0.0	56.0	11.5	14.0	3.0	10.5	-	-	-	-	-		
14	9.5	1.8	0.0	12.8	2.4	0.0	24.5	0.0	12.6	52.5	0	17.2	0.0	1.5	20.0	11.0	2.0	8.0	16.0	-	-	1.0	-	109.0		
15	17.3	7.6	0.3	0.4	6.1	0.0	11.9	15.6	12.1	17.2	48.5	4.5	0.0	16.5	19.0	6.5	0.0	0.0	11.0	33.0	-	-	-	-	16.5	
16	21.2	28.5	0.0	8.3	0.0	0.0	18.8	15.7	0	4.5	29.2	5.8	22.0	21.0	17.5	27.5	0.0	19.0	14.0	36.0	-	-	-	-		
17	12.1	0.0	0.0	17.4	0.0	0.0	15.6	2.8	0	5.8	7.8	14.5	33.0	1.5	7.5	1.0	11.0	13.5	12.5	-	-	-	-	-		
18	6.2	12.8	0.0	33.7	0.0	0.0	0.1	0.0	0	14.5	0	0.0	15.0	3.0	57.5	7.5	12.0	9.0	6.5	-	-	3.5	-	56.0		
19	2.1	2.6	0.1	7.9	27.2	0.0	0.0	0.0	0	0.0	0	18.5	2.0	48.0	15.5	9.5	0.0	0.0	11.5	-	-	-	-	-	1.0	
20	14.5	21.5	2.8	0.2	2.7	0.3	14.0	0.0	0.6	18.5	0	0.0	0.0	0.0	29.5	6.5	0.0	0.0	96.0	30.0	3.0	15.5	-	-	-	
21	0.0	2.8	55.6	16.7	8.2	9.9	33.3	0.0	0	0.0	1.4	1.5	4.0	87.5	45.0	0.0	1.0	6.0	0.0	5.0	-	-	-	-	2.5	
22	18.4	0.5	27.1	60.2	27.8	6.4	64.0	0.0	0	1.5	13.0	0.3	0.0	18.0	33.0	0.0	0.5	6.5	1.5	2.0	3.5	-	-	-	-	
23	0.0	0.0	7.1	0.1	0.0	9.0	6.6	0.0	0	3.3	5.0	2.3	0.0	6.0	18.0	0.0	0.0	37.0	5.5	42.0	2.5	-	-	-	37.0	
24	0.0	5.4	0.2	2.3	0.0	10.0	0.8	15.4	0	2.3	0.0	0.0	3.0	37.5	3.0	0.0	63.5	54.0	5.5	24.0	-	-	-	-	14.0	
25	26.5	0.9	3.5	0.0	0.0	10.2	26.4	0.0	0	0.0	9.0	9.6	0.0	5.5	29.0	0.0	1.0	16.5	4.0	46.5	-	-	-	-	-	
26	10.7	66.3	0.0	0.0	81.4	19.3	9.4	13.1	40	98	0.2	0.0	52.0	5.5	9.0	9.0	0.0	38.0	47.5	41.0	6.5	-	-	-	-	
27	18.0	0.1	1.5	0.0	2.8	54.0	6.8	0.0	0	0.0	0.0	15.5	5.5	8.5	11.0	0.0	0.0	9.5	9.0	9.0	-	-	-	-	1.0	
28	0.0	3.7	16.4	0.0	0.8	28.5	10.9	0.6	9	15.5	0.0	5.0	17.5	27.0	31.5	0.5	0.0	0.0	28.0	20.0	-	-	-	-	-	
29	2.1	18.5	0.0	0.0	0.0	0.0	25.4	17.6	0.8	5.0	1.2	22.0	1.5	82.0	37.0	5.0	14.0	0.0	112.5	51.0	-	-	-	-	-	
30	0.0	0.2	0.0	0.0	0.0	7.4	14.5	7.9	19.4	22.0	0.0	0.5	5.0	14.5	38.5	5.5	0.0	4.0	0.0	24.0	0.5	-	-	-	6.0	
31	0.0	0.0	0.0	0.0	0.0	6.2	24.1	6.8	31.5	0.5	20.0	0.0	1.0	3.0	15.0	0.0	0.0	0.0	0.5	29.0	81.0	-	-	-	-	
Total	268.6	304.8	220.7	273.7	175.3	236.5	517.9	244.6	173.9	229.1	261.8	229.1	364.0	529.0	695.5	252.1	265.5	434.0	480.0	457.5	303.2	348.5	-	-	-	330.2
N	12.0	9.0	7.0	9.0	4.0	7.0	16.0	9.0	7.0	8.0	6.0	8.0	11.0	12.0	22.0	8.0	10.0	11.0	15.0	14.0	4.0	7.0	-	-	-	9.8

Stung Treng Daily Rainfall 7

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021			
8月1日	0.0	4.2	0.0	0.0	0.0	7.4	0.3	8.6	0	0.0	6.4	13.2	9.0	29.5	23.5	0.0	0.0	12.5	2.5	25.0	-	-	-	-	
2	5.3	21.0	12.1	12.1	13.2	4.9	0.0	6.5	8	13.2	0.2	2.8	86.0	10.0	4.0	0.5	0.0	4.5	3.5	5.0	16.0	-	-	-	-
3	0.0	1.5	13.5	13.5	0.0	0.0	1.3	3.5	15.5	2.8	8.8	0.0	7.0	49.5	9.0	0.0	4.3	18.0	1.0	-	-	2.0	-	-	-
4	15.0	43.8	6.1	6.1	2.6	0.0	4.4	37.2	11.8	0.0	3.5	24.5	11.0	0.0	37.0	39.0	24.0	4.5	25.0	-	-	0.5	-	-	1.5
5	8.0	8.1	3.6	3.6	15.6	0.0	0.0	131.1	5.6	24.5	0	3.1	5.5	0.0	47.5	7.0	16.3	115.5	12.5	10.0	41.0	17.0	-	-	-
6	0.0	2.3	0.4	0.4	0.0	2.2	6.6	30.0	10.3	3.1	0	0.0	7.5	8.0	22.0	0.0	3.7	0.0	40.0	22.0	24.0	16.0	-	-	-
7	20.0	27.7	2.7	2.7	106.9	27.1	3.3	0.0	23.5	0.0	14.0	12.0	12.0	0.0	0.0	53.0	10.0	0.0	16.0	14.0	22.0	-	-	-	-
8	21.3	16.9	2.2	2.2	25.9	12.0	0.0	0.0	19.1	12.0	1.5	9.5	6.5	5.5	0.0	6.5	0.0	0.0	0.0	-	-	10.0	-	-	-
9	0.0	0.0	47.3	47.3	30.5	4.0	4.9	9.2	8	9.5	7.5	0.0	19.0	6.0	0.0	0.0	0.0	2.5	2.5	45.0	24.0	-	-	-	-
10	0.0	0.0	1.8	1.8	24.0	8.9	0.0	20.5	23.5	0.0	0.0	0.0	12.5	10.0	0.0	10.0	0.0	0.0	0.0	25.0	13.0	10.0	-	-	-
11	45.5	0.0	0.8	0.8	12.4	0.0	7.6	11.1	27	0.0	18.5	5.2	0.0	25.5	0.0	2.5	0.0	0.0	0.5	0.5	23.0	19.0	-	-	-
12	0.0	0.0	34.7	34.7	0.7	8.8	56.7	1.3	0.5	5.2	30.7	0.0	0.0	22.0	0.0	6.5	3.3	0.0	6.5	40.0	52.0	16.0	-	-	-
13	0.0	7.1	11.0	11.0	5.0	0.0	18.5	5.4	0	0.0	5.7	0.0	0.0	29.5	0.0	0.0	2.4	0.0	9.5	-	-	52.0	-	-	-
14	0.0	1.8	5.3	5.3	0.0	0.0	4.9	0.0	0	0.0	13.0	2.0	28.0	3.0	0.0	0.0	0.0	0.0	14.0	5.0	1.0	4.0	-	-	-
15	0.0	7.6	7.0	7.0	1.2	0.0	7.3	4.5	21.2	2.0	0	0.0	4.5	4.0	0.0	0.0	0.0	0.0	3.0	-	-	0.6	0.5	-	-
16	0.0	28.4	0.1	0.1	0.0	0.0	4.9	32.5	0	0.0	1.5	0.0	3.5	3.0	0.0	0.0	17.7	9.0	0.0	8.5	14.0	-	-	-	-
17	16.5	0.0	5.6	5.6	22.8	0.0	0.5	13.9	29.3	0.0	16.5	0.0	24.5	0.0	0.0	0.0	0.0	0.5	18.5	-	-	0.2	-	-	24.0
18	0.0	12.8	30.7	30.7	29.0	0.0	0.2	5.7	0.5	0.0	19.0	0.0	17.0	0.0											

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
9月1日	5.1	0.0	6.2	6.2	2.3	7.3	0.0	0.0	5.4	11.5	35.0	1.0	2.0	0.0	20.0	17.0	0.0	27.0	0.0	10.0	1.0	-	-	
2	6.3	0.0	2.1	2.1	43.3	50.5	0.0	4.6	10.5	1.0	0.3	0.0	47.0	0.0	6.0	0.0	2.0	23.5	1.0	31.0	13.0	11.0	-	
3	13.5	20.1	21.8	21.8	0.1	0.0	9.4	1.0	12.3	0.0	41.5	18.8	24.0	0.0	0.0	9.0	0.0	1.0	38.0	25.0	-	10.0	-	
4	28.5	1.6	22.4	22.4	22.4	0.0	14.3	0.0	0	18.8	8.0	23.0	7.0	0.0	150.4	0.0	0.0	0.0	11.0	-	-	103.0	-	
5	5.4	0.0	0.1	0.1	2.8	4.2	34.6	0.0	0	23.0	1.5	12.0	22.7	0.0	0.0	0.0	26.0	0.0	21.0	35.0	-	94.5	-	
6	38.0	0.0	0.2	0.2	2.4	14.2	0.0	0.0	5.7	12.0	0.3	33.2	5.0	0.0	0.0	0.0	10.0	16.0	0.0	-	-	-	-	
7	0.0	17.1	14.0	14.0	0.1	15.7	0.0	0.0	9.5	33.2	0	18.5	0.0	0.0	0.0	0.0	27.0	0.0	60.0	-	-	20.0	-	
8	1.5	22.8	0.5	0.5	3.7	9.6	3.8	13.7	3	18.5	0	27.7	1.5	0.0	0.0	33.0	19.0	0.0	5.0	35.5	-	14.0	-	
9	0.0	19.1	6.7	6.7	2.7	58.3	0.0	19.8	0	27.7	0	0.0	0.0	0.0	0.0	50.0	0.0	6.5	1.5	13.5	1.5	39.0	-	
10	0.0	0.0	0.8	0.8	12.5	37.0	2.3	0.0	59	0.0	18.0	0.0	17.5	0.0	0.0	22.0	0.0	0.0	0.0	6.5	-	8.0	-	
11	11.2	0.3	12.7	12.7	36.9	6.0	11.0	0.0	21	0.0	0	0.0	17.5	0.0	0.0	0.0	45.5	6.5	1.0	-	-	4.5	-	
12	9.0	11.8	27.9	27.9	9.4	6.7	62.5	2.3	14	0.0	0	0.0	3.0	0.0	47.0	0.0	35.0	0.0	29.0	3.5	14.0	3.0	-	
13	36.8	0.0	4.3	4.3	20.5	20.7	31.0	0.0	26.2	0.0	4.2	10.7	8.0	0.0	20.0	0.5	10.0	0.0	7.0	9.0	22.5	1.0	-	
14	0.0	0.0	0.7	0.7	1.2	9.9	6.5	17.5	10.7	10.7	8.5	10.3	19.0	0.0	19.0	32.0	3.0	0.0	0.0	3.5	6.0	2.5	-	
15	0.0	66.1	36.0	36.0	0.0	0.0	0.0	0.0	56.4	10.3	2.0	3.8	2.5	3.7	1.0	13.0	17.5	5.0	0.0	-	-	-	-	
16	0.0	0.0	6.2	6.2	3.8	0.0	2.4	0.0	41	3.8	2	0.0	1.0	22.0	7.0	9.5	18.0	0.0	1.5	5.0	-	-	-	
17	0.0	0.0	42.6	42.6	0.0	0.0	71.2	25.5	10.3	0.0	13.2	11.7	18.0	25.5	13.0	0.5	6.0	41.5	2.5	2.0	47.0	-	-	
18	19.8	5.5	9.8	9.8	4.0	4.6	0.0	0.0	0	11.7	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	21.5	57.0	22.0	-	
19	7.8	0.0	1.0	1.0	13.2	1.3	1.5	22.0	36.5	0.0	0	0.0	0.5	0.0	0.0	0.0	23.0	12.5	0.0	24.4	14.0	2.5	-	
20	34.5	0.0	14.0	14.0	17.9	0.0	0.0	7.0	4.7	0.0	0	29.0	10.0	0.0	16.0	0.0	5.5	0.0	7.0	0.0	2.0	6.0	-	
21	0.0	6.8	8.4	8.4	1.7	0.0	6.0	0.0	1.3	29.0	0	5.8	0.0	0.0	1.0	0.5	23.0	0.0	5.5	9.0	-	4.5	-	
22	1.6	0.2	0.8	0.8	0.0	0.0	18.6	0.0	0	5.8	0	0.0	0.0	0.0	7.0	0.0	51.0	13.0	1.5	100.0	-	-	-	
23	12.5	0.4	2.6	2.6	0.0	47.0	0.5	0.0	0	0.0	0.0	5.2	9.5	0.0	2.0	0.5	22.0	23.5	0.0	-	-	8.0	-	
24	0.0	9.7	0.0	0.3	0.0	17.2	0.0	0.0	0	5.2	0.0	5.5	12.0	0.0	0.0	2.0	0.0	0.0	13.0	-	13.0	34.0	-	
25	0.0	27.6	0.0	15.4	0.0	3.0	0.0	0.0	0	5.5	0.5	7.2	39.5	0.0	48.0	5.5	3.0	1.0	0.0	-	23.8	4.5	-	
26	30.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	7.2	0.0	9.2	0.0	0.0	0.0	0.0	61.5	0.0	0.0	-	6.0	-	-	
27	0.0	2.4	0.0	0.0	0.0	4.0	21.7	47.0	3.3	9.2	1.5	35.0	19.5	0.0	0.0	3.0	5.5	5.0	0.5	-	-	-	-	
28	0.0	19.2	0.0	0.0	2.2	0.0	2.4	113.7	0	35.0	0	100.5	11.5	0.0	9.5	5.0	0.0	8.0	1.5	-	3.5	4.5	-	
29	17.0	1.1	0.3	0.0	0.6	0.0	9.2	0.0	6.5	100.5	1.0	16.2	0.0	0.0	5.5	0.0	33.0	50.5	4.0	-	-	2.0	-	
30	2.3	15.3	15.4	0.0	0.8	0.7	0.0	0.0	11.5	16.2	6.0	15.0	0.0	0.0	20.0	1.5	0.0	11.0	63.0	5.0	20.0	-	-	
Total	281.5	247.1	257.5	257.5	204.4	320.9	327.9	273.9	352.0	395.8	143.5	399.3	289.2	51.2	392.4	204.5	446.5	251.5	280.5	339.4	244.3	388.5	289.1	-
N	10.0	9.0	9.0	9.0	7.0	8.0	8.0	7.0	12.0	14.0	4.0	14.0	12.0	2.0	9.0	8.0	15.0	9.0	7.0	9.0	9.0	9.0	9.0	-

Stung Treng Daily Rainfall 9

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
10月1日	0.0	0.0	6.2	5.6	7.7	0.0	0.7	0.0	0	15.0	7.8	0.0	15.5	0.0	0.0	1.8	0.0	10.0	19.5	-	-	-	-	-
2	0.0	13.6	2.1	0.0	2.3	0.0	0.6	1.2	13.2	0.0	12.5	0.6	9.0	0.0	0.0	9.4	0.0	5.0	28.0	-	-	48.5	-	-
3	0.0	0.9	21.8	0.0	5.8	0.0	5.0	0.5	0	0.6	2.0	28.5	6.5	0.0	0.0	6.8	0.0	20.0	0.0	26.0	-	-	-	-
4	0.0	0.2	22.4	0.0	28.7	1.5	36.7	19.5	0	28.5	63.5	0.0	0.0	0.0	10.0	13.5	0.0	20.5	6.0	2.0	-	-	-	-
5	28.5	3.1	0.1	0.0	0.1	0.0	0.0	12.7	0	0.0	70.5	0.0	28.5	0.0	15.5	8.4	3.5	0.0	0.0	-	7.5	-	-	-
6	9.0	18.7	0.2	1.9	79.9	0.0	1.1	0.0	0	0.0	0.0	0.0	19.0	9.0	32.5	0.0	7.0	12.5	0.0	64.5	-	2.0	-	
7	0.0	11.1	14.0	8.8	0.0	0.0	11.1	0.0	0	0.0	0.0	29.0	0.0	11.5	3.0	0.0	1.0	12.5	0.0	-	0.5	-	-	
8	0.0	16.9	0.5	0.0	0.0	7.4	121.0	0.0	0	29.0	0.0	5.5	4.0	4.5	19.0	10.6	0.0	0.0	0.0	-	5.5	-	-	
9	0.0	0.0	6.7	0.0	0.0	0.0	6.5	0.0	23	5.5	0.0	4.0	8.0	0.0	0.0	2.6	0.0	0.0	0.0	-	106.5	15.5	-	
10	28.0	12.6	0.8	0.0	0.0	0.0	5.7	5.6	0	4.0	15.5	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	-	-	3.5	-	
11	64.3	0.0	12.7	0.0	2.0	13.5	4.7	16.6	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	7.0	0.0	2.5	1.0	3.8	-	
12	4.5	0.0	27.9	0.0	0.0	10.5	0.0	55.7	0	0.0	5.0	0.0	1.5	0.0	0.0	1.4	0.0	9.5	0.0	-	-	65.0	-	
13	0.0	7.3	4.3	0.0	0.0	0.9	1.3	45.4	0	0.0	0.0	17.0	9.0	0.0	0.0	8.5	0.0	34.0	2.0	-	-	25.5	-	
14	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0	17.0	28.5	22.0	0.0	0.0	0.0	11.0	0.0	8.5	0.0	-	14.5	30.0	-	
15	0.0	0.0	36.0	3.4	0.0	0.0	0.0	3.9	15	22.0	9.7	1.0	0.0	0.0	0.0	0.6	4.5	0.0	0.0	-	10.0	7.5	-	
16	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	2.7	1.0	0.0	0.5	0.0	0.0	1.5	1.2	83.0	61.5	0.0	-	36.5	9.0	-	
17	8.3	0.0	42.6	0.0	0.0	0.0	0.0	8.5	3.5	0.5	3.6	0.3	0.0	8.0	0.0	4.8	0.0	7.0	62.0	-	11.0	10.5	-	
18	0.0	3.5	9.8	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	14.0	2.0	2.0	12.0	2.5	-	
19	0.0	1.2	1.0	0.0	0.0	0.0	0.0	0.0	0	0.0	18.5	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	43.5	4.5	-	
20	0.0	2.3	14.0	0.0	0.0	0.0	0.0	0.0	0	8.7	5.5	1.2	0.0	0.0	8.5	11.6	0.0	0.0	0.0	-	1.0	7.0	-	
21	0.0	2.7	8.4	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0	0.0	0.0	0.0	0.0	6.4	0.0	0						

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
11月1日	0.0	0.0	0.0	7.7	0.0	0.0	37.9	0.5	0.0	0	30.7	0.0	0.0	0.0	0.0	3.0	1.0	0.0	0.0	2.5	-	-
2	0.0	0.0	0.2	0.2	2.3	0.0	0.0	10.4	30.7	0.7	0.0	0.0	0.0	0.0	7.5	15.0	0.0	0.0	6.0	-	-	
3	0.0	0.0	0.0	0.0	5.8	0.0	0.0	17.5	0.0	0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	27.0	-	-	
4	0.0	0.0	0.0	0.0	28.7	2.2	0.0	3.5	0.0	0	0.0	0.0	0.0	0.0	3.0	0.0	20.0	0.0	-	-		
5	0.0	0.0	0.0	0.0	0.1	13.0	0.0	0.0	0	0.0	0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
6	0.0	7.5	0.0	0.0	79.8	0.0	0.0	0	37.5	0	0.0	0.0	0.0	8.0	0.0	6.5	99.0	11.0	0.0	-	1.0	
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	3.5	0.0	3.0	1.0	-	5.0	
8	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	0	0.0	0	0.0	0.0	4.5	0.0	0.0	1.0	6.5	0.0	-	0.5	
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	-	-	
10	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	1.0	5.0	
11	0.0	5.0	0.0	0.0	2.0	0.0	0.0	15.8	0	0.0	0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	3.5	72.5	
12	0.0	30.0	0.7	0.7	0.0	0.0	0.0	13.8	0	0.0	0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	1.0	12.3	
13	0.0	0.1	0.0	0.0	0.0	0.0	0.0	11.1	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
17	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	10.5	0.0	17.5	8.0	0.0	0.0	18.0	0.0	0.0	-	-	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0	0.0	4.5	0.0	0.0	0.0	0.0	1.5	0.0	0.0	-	-	
19	0.0	0.0	2.3	2.3	0.0	0.0	1.3	0	0.0	0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.0	-	-		
20	0.0	0.0	0.1	0.1	0.0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	-	-	
21	0.0	0.0	3.5	3.5	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
22	0.0	0.0	14.2	0.0	0.0	0.0	0.0	0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	-	-		
23	0.0	0.0	13.3	0.0	2.5	0.0	0.0	0	0.0	0	0.0	46.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0	-	-	
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-	-	
26	0.0	0.0	0.0	0.0	10.2	0.0	0.0	12.7	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	-	-	
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	-	-	
28	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	-	
29	0.0	0.0	0.0	14.2	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
30	0.0	0.0	0.0	13.3	1.2	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
Total	0.0	42.6	35.0	35.0	130.3	35.9	0.1	89.3	50.6	68.2	13.3	66.2	77.8	33.0	0.0	31.5	141.0	48.5	3.7	43.0	95.8	
N	0.0	1.0	2.0	2.0	2.0	3.0	0.0	5.0	3.0	2.0	1.0	2.0	2.0	1.0	0.0	0.0	3.0	3.0	0.0	1.0	2.0	

Stung Treng Daily Rainfall 11

Stung Treng Daily Rainfall (mm/Day)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
12月1日	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	23.5	10.0	0.0	-	-	
5	0.0	0.0	0.0	0.0	0.0	37.6	11.5	0.5	0	0.0	0	0.0	0.0	0.0	0.0	0.0	2.0	5.5	0.0	-	-	
6	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0	0.0	14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
9	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
11	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	24.5	0.0	0.0	-	-	
13	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	-	-	
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	31.5	0.0	0.0	-	-	
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	3.7	0.0	0.0	1.0	0.0	0.0	0.0	-	-	
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	1.7	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	25.5	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
22	0.0	0.0	9.8	9.8	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
23	0.0	0.0	4.7	4.7	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	4.0	
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.5	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0														