Conservation and Restoration of Angkor Wat and Ta Prohm Temple, Siem Reap, Cambodia

India-Cambodia Co-operation Project
Conservation of Ta Prohm Temple Complex

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Archaeological Survey of India
Outline of the presentation

Introduction – ASI’s foray in Cambodia

Conservation works – Angkor Wat (1986 – 93)

Ongoing Conservation Works – Ta Prohm (2004 onwards)
Fact File:

Cambodia is primarily a large depressed basin and a major part of the country is covered with tropical evergreen forest;
Hot and Humid Climate;
Bordered by Thailand, Vietnam and Laos;
Capital: Phnom Penh;
Tourism the main contributor to the Cambodian Economy;
Angkor region in proximity to the great Lake Tonle Sap, fed by the waters of Mekong river
India – Cambodia Cooperation

India – Cambodia (Kambujadesha) cooperation goes back to approx 5th – 6th Century CE;

Trade and Commerce established cultural relations between the two regions;

Khmer emperors (9th – 15th Cen CE) adopted Indian religions, Hinduism and Buddhism, and patronised art and architecture reflecting tenets of Indian iconography and architecture; Many temple complexes within the Angkor region;

Government of India’s cooperation with the R.G of Cambodia continues from mid-1980s by providing technical assistance for the conservation of Angkor Wat (1986 – 93) and Ta Prohm (2004 – till date)
Conservation and Restoration of Angkor Wat and Ta Prohm Temple, Siem Reap, Cambodia
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Background

Project launched in **February 2004** by Secretary Culture, India;

Funded by the Ministry of External Affairs, Government of India;

Currently team from **Archaeological Survey of India (ASI)** is working onsite.
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Located to the North east of the famous Angkor Vat temple enclosed within an area of 1105m x 663.00m

Concentric in plan having five rectangular enclosures with *gopuras* (gateways) and moats.

The statue of "Prajnaparamita" personification of mother of Buddha was placed in the central shrine.
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GOPURA ON FOURTH ENCLOSURE (EAST), TA - PROHM, TEMPLE

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The Entwining Tree Roots, TA- PROHM, TEMPLE

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Stagnated Water in TA-PROHM, TEMPLE

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Stagnated Water in TA-PROHM, TEMPLE

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Wooden Bye-pass Bridge over Outer Moat (West side), Ta-Prohm Temple

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Collapsed third Enclosures Gallery on North East, Ta-Prohm, Temple

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Hall of Dancers in Ta-Prohm Temple

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South Gate, Ta Prohm, Temple

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Conservation Strategy

Archaeological Survey of India (ASI) has adopted a **multidisciplinary integrated scientific approach** for the conservation and restoration of this Temple.

Aims

- To **protect the tangible and the intangible values** of this temple;
- **Maintain the OUV** by **preserving the authenticity and integrity** of the temple complex and undertake minimum interventions;
- Protect and preserve the natural and the built heritage and ensure its sustainability and maintain the symbiotic relation;
- Make the site **more accessible** and **ensure safety** of the visitors;
- To enable **transfer of skills and training** of local Cambodians.
The Multidisciplinary team

Archaeologists, Engineers, Epigraphists, Historians and Architects, from Archaeological Survey of India (ASI)

Engineers from Indian Institute of Technology and Larsen and Toubro, to address the issues of structural stability and ensure effective monitoring of the site

Hydrologists and Engineers from Water and Power Consultancy Services (WAPCOS) to address the issue of water stagnation in the temple

Scientists, Botanists and Arboriculturists from Forest Research Institute (FRI) and Indian Council for Forest and Education (ICFRE), for the conservation of the trees
Technical Studies Undertaken

Study of the Structural Systems of the Temple
- Structural behavior of the Corbelled vaults
- Geotechnical studies
- Hydrological studies
- Botanical and Arboriculture studies
- Material testing
- Ground Penetrating Radar Survey
- Monitoring mechanisms
Site Plan, Ta-Prohm, Temple

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Collapsed third Enclosures Gallery on South East, Ta-Prohm, Temple

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Causeway Between Third and Fourth Enclosure on West Ta- Prohm, Temple

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Fourth Enclosure Gopura on West, Ta-Prohm, Temple

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Hall Of Dancers, Ta- Prohm, Temple

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Laterite Wall Along with Gate on Fifth Enclosure (West), Ta- Prohm, Temple

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Ongoing Conservation

Work of

“Hall of Dancer”
Arial view and western elevation before removal of fallen stones
North-east corner before dismantling inclined wall and removing fallen stones

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In situ plan before removal of fallen stones

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Hall of Dancers - Existing top plan

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Hall of Dancers - Elevations
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Hall of Dancers - Elevations

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Hall of Dancers • Soil Investigations

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Conservation Approach

Conservation based on *Anastylosis*;

Partial restoration of the Hall of Dancers to reflect the restored structure as well its earlier condition (as it was found);

Essential retrofitting and consolidation of the structure and stone members (structural and ornamental);

No structural corrections to follow the natural undulations of the surfaces;

Minimal intervention; to retain its archaeological value.
Methodology

Comprehensive documentation of the structure and *in-situ* and stone by stone documentation;

Partial dismantling of the exterior walls (east, north and west sides) and strengthening of the foundations;

Floor strengthening; Opening up the original two drains;

Repairs and joining of stones (Columns, lintels, pediments, etc., wherever necessary after due strengthening including strapping, etc., original and new interventions clearly discernible;

Repairs to the semi-vaulted roof (on-going)
Plan showing the stacking position of fallen stones

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Hall of Dancers - Mending of broken plinth stones with epoxy, threaded stainless steel rods and polymer.
Hall of Dancers - Mending of vaults with epoxy, threaded stainless steel rods and polymer.
Hall of Dancers - Mending of broken plinth stones with epoxy, threaded stainless steel rods and polymer.
Hall of Dancers - Exposed laterite apron along the north east plinth.
Hall of Dancers - Filling plinth foundation with lime and sand.
Hall of Dancers - Inter northern floor after removal of sandstones and laterite stones.
Hall of Dancers - Consolidation of interior northern floor foundation.
Hall of Dancers - Compaction of soil under the floor.
Hall of Dancers - Re-laying of interior northern laterite core after consolidation.
Hall of Dancers - Resetting of sand stone wall on eastern side.
Hall of Dancers - Resembling of main entrance gate on eastern porch.
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Eastern Entrance, Hall of Dancers
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Before-2010

During-2011-12

During-2013-14

North-East corner, Hall of Dancers

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North-West corner, Hall of Dancers

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North-Western Corner Entrance, Hall of Dancers

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Western Entrance, Hall of Dancers

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Interior of the Hall of Dancers (main passage)

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Before-2010

During-2011-12

During-2013-14

Interior of Hall of Dancers (North-east)

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South-west Corner (Discernible distinction - original and restored portions)

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Hall of Dancers (Northern Passage restoration)
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Interior elevation before and after removal of fallen stones

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North-west corner restoration - Hall of Dancers

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Hall of Dancers (north-west corner)

Before-2010

During-2011-12

During-2013-14

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Hall of Dancers (North-east Corner)

Before-2010

During-2011-12

During-2013-14

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Buddha Statues found near Hall of Dancers
Hall of Dancers – Site plan showing location of suspected sculptures

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Buddha statue surface exposed after heavy rains near laterite wall.
Buddha statue surface exposed after heavy rains near laterite wall.
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Buddha statue (Small size)

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Hall of Dancers - Aerial View of Small Buddha

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Headless Buddha statue (Small Size)

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Buddha statue (Big size) exposed after heavy rains

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Hall of Dancers - Aerial View of Big Buddha

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Headless Buddha statue (Big size)

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Part of the Golden crown found near Hall of Dancers

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Location plan – Part of Golden Crown
Visibility part of golden crown - After removal of second layer silt from the laterite floor.
Recovery part of golden crown from deposit silt - In presence of HE. R.K.Sachdeva, Ambassador of India and APSARA officials.
Part of the golden crown - Cleaning process in APSARA office. In presence of HE. Bun Raith, D.G. APSARA Authority
Part of golden Crown - After cleaning with weight
Golden Crown
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Pre-Conservation

During Conservation

After Conservation

Third Enclosure Gallery, Eastern side South wing

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Pre-Conservation

During Conservation

After Conservation

Third Enclosure Gallery, Eastern side South wing

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Pre-Conservation

After Conservation

Third Enclosure Gallery, Eastern side South wing

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Third Enclosure Gallery, Eastern side South wing

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Causeway connecting 3rd and 4th Enclosure West

Pre-Conservation  
During Conservation  
After Conservation

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Causeway connecting 3rd and 4th Enclosure West.
Causeway connecting 3rd and 4th Enclosure West
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Pre-Conservation

During Conservation

After Conservation

Entrance Gopurum of 4th Enclosure West

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Pre-Conservation

During Conservation

After Conservation

Entrance Gopurum of 4th Enclosure West

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Entrance Gopurum of 4th Enclosure West

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Entrance Gopurum of 4th Enclosure West

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Entrance Gopura of 4th Enclosure West
Entrance Gopura of 4th Enclosure West
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Entrance Gopura of 4th Enclosure West
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Laterite Enclosure Wall - Entrance Gopurum of 5th Enclosure West

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Reinforcement of central axis Tower  (Location no.3)
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Tower along central axis (Location no.3)

Before

During

After
Tower along central axis (Location no.3)

Before

During

After
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Before

During

After

Entrance Gopura of 5th Enclosure (West)
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GOPURA ON FIFTH ENCLOSURE (West), TA-PROHM, TEMPLE

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Reversible supports
Tilt meters at 4 locations to monitor rate of inclination

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Crack meters installed at 4 location to determine rate of movement

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Tree Support along with weather station

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Wooden Walkways

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Construction of bypass bridge for exit from south

Before

During

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Construction of bye pass bridge for exit from south

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Future Conservation
Works to be undertaken by ASI
(Phase III)
Ta Prohm Temple – Location plan of new proposals
Plan of Eastern Gate

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East Gate Facing West
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East Gate Facing East

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Conjectural Elevation of East Gate

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South Gate - facing North
Thank you for kind attention....

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