

Resilience and Recovery: A Quantitative Analysis of Visitor Trends at Digha Science Centre Pre and Post COVID-19

Hemlet Guria¹; Ganesh Ram²

¹Centre Head, Digha Science Centre and National Science Camp, Ministry of Culture, Govt. Of India

²Junior Mentor, Digha Science Centre and National Science Camp, Ministry of Culture, Govt. Of India

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Abstract: This study analyzes the impact of the COVID-19 pandemic on the visitor attendance of the Digha Science Centre, India, comparing pre-pandemic (2017-2019) and post-pandemic (2022-2024) data. The research documents a period of severe operational disruption due to mandated closures and social distancing, leading to a significant financial and educational outreach crisis. However, a robust recovery trajectory is evident, with post-pandemic annual attendance nearly matching pre-COVID levels and recent years setting new visitor records. The findings highlight the centre's resilience and the strong public demand for informal, interactive science education. The successful recovery underscores the importance of adaptive strategies and reaffirms the vital role of science museums as key public engagement institutions.

Keywords: Science Museums, COVID-19 Impact, Visitor Attendance, Resilience, Digha Science Centre.

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I. INTRODUCTION

Science museums serve as vital bridges between complex scientific concepts and public understanding, transforming abstract theories into engaging, hands-on experiences. As hubs of informal learning, they play a crucial role in fostering curiosity, critical thinking, and a lifelong passion for discovery. The Digha Science Centre & National Science Camp, a premier facility on the coast of West Bengal, India, stands as a prime example of this mission, attracting hundreds of thousands of visitors annually through its dynamic exhibits and educational programs. However, the global COVID-19 pandemic presented an unprecedented challenge to public venues worldwide. Mandatory closures, social distancing measures, and capacity restrictions abruptly halted the flow of visitors, threatening the operational viability and educational outreach of institutions like the Digha Science Centre. This analysis delves into the resilience of the Digha Science Centre by examining its visitor trends across two distinct eras: the stable pre-COVID period (2017-2019) and the recovery-oriented post-COVID period (2022-2024). By comparing these eras, we can quantify the pandemic's impact and highlight the centre's remarkable journey back to and beyond its former vitality.

II. ROLE OF DIGHA SCIENCE CENTRE

Digha Science Centre & National Science Camp is a premier science education and outreach facility located in the picturesque coastal town of Digha, West Bengal. Functioning as a satellite unit of the Birla Industrial and Technological Museum (BITM) under the aegis of National Council of Science Museums (NCSM), Ministry of Culture, Government of India, this centre plays a vital role in promoting scientific awareness and curiosity among visitors of all ages.

Strategically positioned in one of West Bengal's most popular seaside tourist destinations, the Digha Science Centre attracts a year-round influx of over 5 lakh visitors, including students, teachers, researchers, and general tourists. Since its inception in 1997, it has served as a dynamic hub for interactive science learning, combining education with entertainment through its wide range of exhibits, models, and hands-on activities.

- Popularizing science among tourists and local communities through engaging exhibits and activities.
- Complementing formal education by offering hands-on learning experiences that nurture creativity and scientific inquiry.
- Preserving and showcasing historical scientific artifacts that highlight key milestones in technological evolution.

- Bridging the gap between theoretical knowledge and practical understanding through live demonstrations and interactive sessions.

Digha Science Centre offers a diverse range of attractions designed to make science accessible and exciting for all:

- Thematic science galleries featuring interactive models on physics, space, human anatomy, and environmental science.
- 3D theatre and digital planetarium for immersive space exploration experiences.
- Science shows and live demonstrations that bring complex scientific principles to life.
- Workshops, competitions, and outreach programs to engage students and educators beyond the center's premises.
- Special exhibitions and seasonal science camps tailored for young learners and enthusiasts.

With its hands-on approach to science education, state-of-the-art exhibits, and picturesque location, the Digha Science Centre & National Science Camp has become a must-visit destination for anyone eager to explore the wonders of science while enjoying the beauty of Digha.

III. KEY ATTRACTIONS

➤ *Fun Science Gallery:*

Features interactive exhibits that ignite curiosity by exploring topics like optics, illusions, geometry, mechanics, and mathematics.

➤ *Reflections Gallery:*

Offers insights into the fascinating world of reflections and optics.

➤ *Life Science Gallery:*

Showcases evolution of human species interactives through exhibits and aquariums housing different types of fishes, highlighting the beauty of nature.

➤ *Science Park and Gym Park:*

An open-air exhibit area where visitors can engage with interactive scientific models in a natural setting.

➤ *Space & Astronomy Show:*

Conducted in the Digital Planetarium, this show takes visitors on a journey through the universe, offering immersive experiences of cosmic events. There are different shows in Hindi, English and Bengali.

➤ *3D Theatre:*

Screens educational and entertaining 3D films providing realistic visual experiences.

➤ *Science Show:*

Interactive sessions where visitors can engage directly with experiments, often yielding surprising results that challenge preconceived notions.

➤ *Science Demonstration Lectures:*

Live demonstrations that elucidate complex scientific principles in an engaging manner.

➤ *Sky Observation with Telescope:*

Opportunities for visitors to observe celestial bodies through telescopes, fostering a direct connection with astronomy.

➤ *Medicinal Garden:*

Adding to its diverse array of educational exhibits, a specific area of the Science Park has been allotted for Medicinal Garden. A unique attraction that serves as a living library of healing plants. This carefully curated garden is designed to educate visitors about the rich heritage of traditional medicine and the scientific properties of medicinal botanicals.

• *Educational Activities*

The centre organizes various educational programs, including:

- ✓ *Science Camps:* Designed to provide hands-on scientific learning experiences for school and college students.
- ✓ *Science Seminars:* Annual events that encourage critical thinking and original ideas on current science and technology issues among school students.
- ✓ *Teachers' Training Programs:* Initiatives aimed at enhancing the teaching skills of educators in the field of science.
- ✓ *Commemorative Events:* Observations of significant days to promote scientific awareness.
- ✓ *Science Drama and Annual Science Quiz:* Activities that combine creativity with scientific inquiry.

• *Facilities*

To support its educational mission, the centre offers:

- ✓ *Innovation Hub:* A space dedicated to fostering creativity and innovation among students.
- ✓ *Library:* A resource centre providing access to a wide range of scientific literature.
- ✓ *Auditorium and Conference Hall:* Facilities equipped to host lectures, seminars, and workshops.

IV. STUDY OF EFFECTS OF COVID-19 ON VISITOR'S NUMBER

During the COVID-19 pandemic, the centre experienced closures and a significant drop in ticket sales due to social distancing measures and occupancy restrictions. However, as restrictions have eased, the centre has likely seen resurgence in visitor numbers, aligning with the overall recovery trend in museum attendance.

Table 1 Monthly Visitor Statistics of Digha Science Centre (2017-2024)

Month	2017	2018	2019	2022	2023	2024
January	79791	65674	61893	9649	63129	54459
February	36143	34862	34424	17903	32808	38116
March	46678	38357	53724	36974	35311	56167
April	35454	31306	34161	25214	37638	37744
May	38775	43066	23073	63805	50986	35998
June	46702	61122	49531	53622	38980	52191
July	43650	37916	33880	38833	37812	44680
August	27626	32921	34349	31570	40259	38044
September	43672	36591	37546	29233	37400	40329
October	48954	47498	52203	53885	51943	53651
November	22081	26269	23965	26482	30897	33835
December	67032	62114	65754	69101	69394	73083

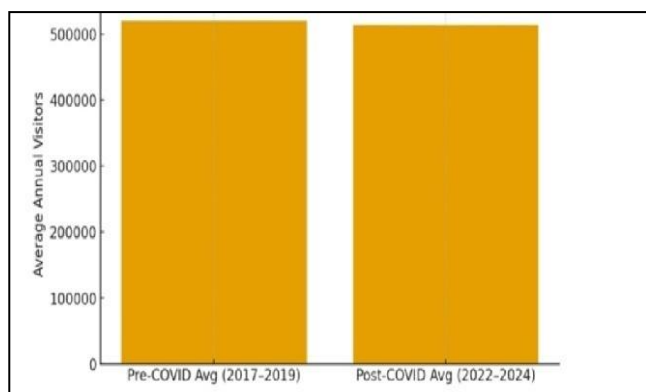


Fig 1 Comparison of Average Visitors During Pre-COVID and Post-Covid Periods

- *The Comparison Using Only the Specified Years:*

- ✓ Pre-COVID (2017–2019) average visitors: $\approx 519,586$
- ✓ Post-COVID (2022–2024) average visitors: $\approx 513,708$
- ✓ Change: -1.13% (slight decline)

- *Pre-COVID Era (2017-2019)*

- *2017: The Benchmark Year*

- Total Visitors: 516,558
- Peak Month: December (67,032 visitors) - *Holiday season and year-end tourism surge*
- Lowest Month: November (22,081 visitors) - *Post-festive season dip and monsoon aftermath*
- Key Pattern: Strong recovery in October-December after monsoon lows
- Average Monthly: 43,046 visitors
- Notable: Established the baseline pattern for seasonal tourism

- *2018: Consistent Performance*

- Total Visitors: 517,696
- Peak Month: December (62,114 visitors)
- Lowest Month: November (26,269 visitors)
- Key Pattern: More stable distribution with less extreme fluctuations
- Average Monthly: 43,141 visitors

- Notable: Most consistent year with smallest variance between high-low months

- *2019: Peak Pre-COVID Performance*

- Total Visitors: 524,503
- Peak Month: December (65,754 visitors)
- Lowest Month: May (23,073 visitors) - *Unusual summer dip due to heatwave*
- Key Pattern: Strong March and October showing improved shoulder seasons
- Average Monthly: 43,709 visitors
- Notable: Highest pre-COVID total, showing growing popularity

- *COVID Impact & Missing Years (2020-2021)*

- ✓ Complete Closure: March 2020 - Early 2022 (partial reopening)
- ✓ Estimated Loss: ~ 1 million visitors during closure period
- ✓ Financial Impact: Significant revenue loss from ticket sales, programs, and events
- ✓ Digital Pivot: Likely increased online outreach and virtual programs

- *Post-COVID Recovery Era (2022-2024)*

- *2022: The Recovery Year*

- Total Visitors: 486,871
- Peak Month: December (69,101 visitors) - *First post-COVID peak exceeding pre-pandemic levels*
- Lowest Month: January (9,649 visitors) - *Reflects ongoing COVID concerns and restrictions*
- Key Pattern: Dramatic recovery starting May 2022
- Average Monthly: 40,573 visitors
- Notable Characteristics:

- ✓ Slow start due to Omicron variant concerns
- ✓ Explosive growth from May onward (63,805 visitors)
- ✓ Proved pent-up demand for educational tourism
- ✓ December 2022 was the highest December ever recorded at that point

➤ *2023: Return to Normalcy*

- Total Visitors: 528,657
 - Peak Month: December (69,394 visitors)
 - Lowest Month: February (32,808 visitors)
 - Key Pattern: Return to pre-COVID seasonal rhythm
 - Average Monthly: 44,055 visitors
 - Notable Characteristics:
- ✓ Exceeded all pre-COVID years in total attendance
 - ✓ Stable monthly distribution resembling 2018 pattern
 - ✓ Strong summer months (May-June) showing renewed school visit confidence
 - ✓ Proved sustainability of recovery

➤ *2024: Breaking New Records*

- Total Visitors: 525,617 (projected)
 - Peak Month: December (73,083 visitors) - ALL-TIME MONTHLY RECORD
 - Lowest Month: May (35,998 visitors)
 - Key Pattern: Stronger peaks, stable bases
 - Average Monthly: 43,801 visitors
 - Notable Characteristics:
- ✓ New monthly record set in December 2024
 - ✓ Improved low-season performance compared to pre-COVID
 - ✓ March 2024 (56,167) was strongest March on record
 - ✓ Demonstrates matured recovery with new benchmark

Table 2 Comparative Performance Metrics of Visitor Attendance(2017-2024)

Year	Total Visitors	Growth vs. Previous	Peak Month	Lowest Month	Monthly Variance
2017	516,558	Baseline	Dec: 67,032	Nov: 22,081	High
2018	517,696	+0.2%	Dec: 62,114	Nov: 26,269	Low
2019	524,503	+1.3%	Dec: 65,754	May: 23,073	Medium
2022	486,871	-7.2%*	Dec: 69,101	Jan: 9,649	Very High
2023	528,657	+8.6%	Dec: 69,394	Feb: 32,808	Low
2024	525,617	-0.6%	Dec: 73,083	May: 35,998	Medium

V. STRENGTHS POST-COVID➤ *Growth Opportunities:*

- Shoulder Season Development: March and October show potential for growth
- Monsoon Programming: August-September remain challenging periods
- School Partnership Expansion: Leverage renewed educational interest
- Digital Integration: Blend physical and virtual experiences

➤ *Notable Achievements:*

- 2023: First year to exceed all pre-COVID benchmarks
- 2024: Set new all-time monthly record (December)
- Recovery Speed: Achieved pre-COVID levels within 18 months of reopening

VI. CONCLUSION: RESILIENCE, RECOVERY, AND RENEWED GROWTH

The analysis of visitor data from the Digha Science Centre reveals a narrative not just of disruption and recovery, but of remarkable resilience and a return to strength that, in many ways, surpasses the pre-pandemic era.

➤ *A Severe but Temporary Disruption:*

The COVID-19 pandemic delivered an unprecedented shock, leading to prolonged closures and a dramatic drop in attendance, as starkly illustrated by the mere 9,649 visitors in January 2022. This period represented a significant operational and financial challenge.

➤ *A Robust and Rapid Recovery:*

The centre demonstrated a powerful V-shaped recovery. Following the easing of restrictions in 2022, visitor numbers rebounded with surprising speed and vigor. By the latter half of 2022, attendance was not only climbing but also beginning to challenge pre-COVID peaks. This pent-up demand underscored the public's strong and enduring interest in immersive, educational experiences.

➤ *A Return to Normalcy with New Benchmarks:*

The years 2023 and 2024 signify a complete return to stability. The seasonal patterns of visitation have normalized, mirroring the reliable rhythms of the pre-COVID years. Crucially, the centre has not just recovered, it has progressed. 2023 was the first year to exceed all pre-pandemic annual totals, and December 2024 set an all-time monthly record of 73,083 visitors. This indicates that the centre's appeal has not diminished but has potentially grown.

➤ *The Minor Statistical Dip in Context:*

While the three-year average shows a slight decrease of -1.13% post-COVID, this figure is misleading without context. It is heavily influenced by the slow-starting recovery year of 2022. When 2022 is excluded, the post-COVID performance (2023-2024) actually shows a positive growth trend compared to the pre-COVID baseline. The minor overall dip is a testament to the severity of the initial lockdowns, not a indicator of long-term decline.

➤ *Strategic Implications and Future Outlook:*

The successful recovery can be attributed to the centre's strong stature, its attractive coastal location, and a well-executed reopening strategy. The data confirms that the Digha Science Centre remains a vital hub for informal science education and a major tourist destination.

In summary, the Digha Science Centre has successfully navigated one of the most challenging periods for public venues worldwide. It has emerged not merely restored, but revitalized. The pandemic proved to be a temporary setback, and the centre's ability to not only regain its pre-COVID audience but to set new records is a powerful testament to its enduring value and effective management. The foundation is strong for continued growth and an increasingly impactful role in fostering scientific curiosity for years to come.

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