



PROVINCIAL PUBLIC HEALTH LAB (PPHL),  
SINDH

DOW UNIVERSITY OF HEALTH SCIENCES

# STRATEGIC PLAN (2024 - 2027)

Pioneering Excellence | Inspiring Innovation



**To Heal | To Educate | To Discover**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

## TABLE OF CONTENTS

Director’s Message .....	5
Executive Summary .....	6
About PPHL.....	7
Introduction & Overview.....	8
Institutional Organogram.....	9
Section I: Overview of the Strategic Planning Process .....	10
Section II: Vision, Mission, and Values .....	11
Section III: Aspirational Institutions.....	13
Section IV: Strategic Goals.....	14
Objectives, OKRs & KPIs.....	16
Section V: Resource Planning for Achieving Strategic Goals.....	22
Section VI: Implementation and Monitoring of Strategic Plan.....	23
Section VII: List of Appendices: .....	24
A: SWOT Analysis.....	25
B: TOWS Matrix.....	26
C: Publications.....	28
D: List of Existing Research Projects.....	29

## DIRECTOR'S MESSAGE



At the Provincial Public Health Laboratory (PPHL), Sindh, our vision is clear: to build a resilient, data-driven, and integrated public health system that safeguards the health of every citizen. As we look ahead, we envision PPHL as a beacon of excellence in disease surveillance, diagnostics, and response—not only in Sindh but across Pakistan and beyond.

Our journey began with addressing critical gaps in public health diagnostics and outbreak management, laying the foundation for a laboratory system capable of responding to today's existing and surfacing challenges. However, the future demands more. By 2030, we see PPHL leading the way in leveraging cutting-edge technologies, artificial intelligence, and genomics to detect and combat emerging and re-emerging infectious diseases.

We aim to create a fully integrated network connecting regional laboratories and healthcare providers, enabling real-time data sharing and evidence-based interventions. Through strategic partnerships, rigorous training, and research-driven policies, PPHL will empower communities, enhance health equity, and drive the transformation of Sindh's public health infrastructure.

Our mission to work proactively and to prevent, protect, and detect is ambitious but achievable. With a focus on innovation, collaboration, and sustainability, PPHL is poised to set new standards for public health excellence, ensuring a healthier, safer future for all.

### **Prof. Dr. Saeed Khan**

*Ph.D., Postdoc (University of Washington, USA), MSPH*

Professor of Pathology: Dow International Medical College

Director: Provincial Public Health Reference Lab, Sindh

Consultant & Section Head: Molecular Pathology

Dow University of Health Sciences, Karachi

## EXECUTIVE SUMMARY

The Provincial Public Health Laboratory (PPHL) in Sindh, a collaborative effort between the Health Department, Dow University of Health Sciences, and the National Institute of Health, was established in March 2021. This state-of-the-art facility, nestled within the Dow University, serves as the cornerstone of Sindh's public health response.

Equipped with a cutting-edge Genome Center and a mobile BSL-2 laboratory, PPHL is uniquely positioned to rapidly identify and respond to disease outbreaks across the province. Our expertise spans molecular diagnostics, microbiology, and immunology, enabling us to provide crucial insights into disease patterns in both urban and rural areas.

At the heart of our mission lies the ability to detect and combat emerging threats like infectious diseases, vector-borne diseases, antimicrobial resistance, zoonotic diseases, and vaccine-preventable illnesses. We achieve this through a combination of advanced technologies, a skilled workforce, and a robust network of healthcare providers.

PPHL is not just a laboratory; it's a hub for collaboration, research, and innovation. We foster partnerships with national and international organizations, conduct cutting-edge research, and empower our staff through continuous professional development.

Our vision is to transform Sindh's public health landscape, ensuring healthier communities and a robust response to any health challenge that may arise.

## ABOUT PPHL

The Provincial Public Health Laboratory (PPHL) was established in March 2021 as a collaborative effort between the Health Department, Dow University of Health Sciences, and the National Institute of Health. It serves as a central hub for public health diagnostics, surveillance, and outbreak response across Sindh.

PPHL is equipped with a Genome Center and a mobile BSL-2 laboratory, enabling rapid response to infectious disease outbreaks, antimicrobial resistance surveillance, and immunological studies. The facility strengthens molecular diagnostics and epidemiological investigations, benefiting both urban and rural communities.

The lab plays a crucial role in early disease detection, vaccine-preventable disease monitoring, and treatment strategies. Through advanced technologies, skilled professionals, and strong public-private partnerships, PPHL enhances Sindh's healthcare system.

## INTRODUCTION & OVERVIEW

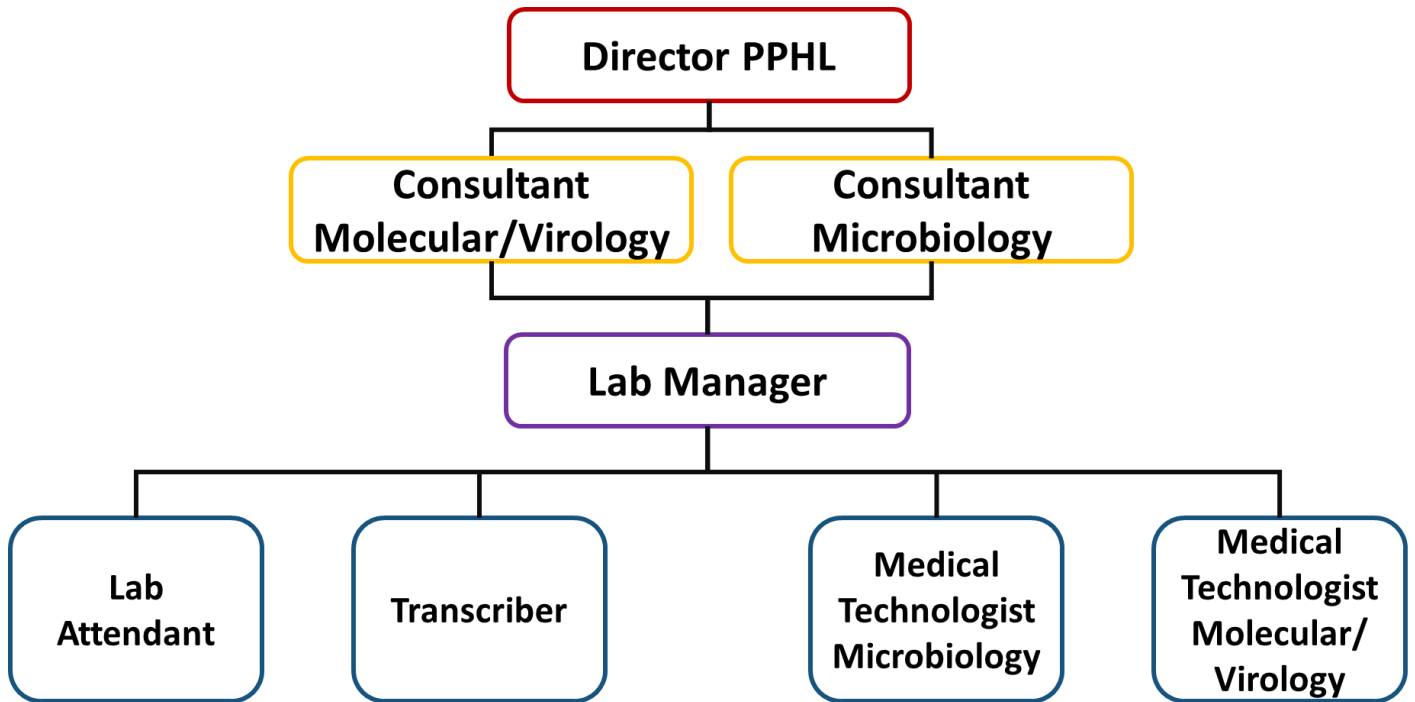
PPHL was founded with the mission to enhance Sindh's public health infrastructure through innovative diagnostics, disease surveillance, and rapid outbreak response. It serves as a reference laboratory for infectious diseases, enabling data-driven decision-making and evidence-based policy formulation.

By integrating next-generation sequencing, pathogen surveillance, and advanced molecular diagnostics, PPHL supports the identification and control of emerging and re-emerging infectious threats. Its efforts contribute to national and global public health initiatives, ensuring faster responses to outbreaks and improved disease management strategies.

PPHL also functions as a training center for healthcare professionals, researchers, and epidemiologists. Through collaborations with national and international partners, it fosters scientific research, innovation, and capacity-building, ultimately strengthening Sindh's healthcare resilience.



# STITUTIONAL ORGANOGRAM



## SECTION I: OVERVIEW OF THE STRATEGIC PLANNING PROCESS

Membership of the Executive Strategic Planning Work Group for the facility was as follows

<b>Prof. Dr. Saeed Khan</b> Program Director PPHL	<b>Chairperson</b>
<b>Dr. Maria Zahid</b> Section Incharge Molecular/Virology, PPHL	<b>Member</b>
<b>Dr. Noor ul Huda</b> Section Incharge Microbiology, PPHL	<b>Member</b>
<b>Mr. Ayaz Ahmed</b> Lab Manager, Molecular, DDRRL	<b>Member</b>
<b>Ms. Hafsa Faruqui</b> Medical Technologist, PPHL	<b>Member</b>

The S.W.O.T analysis served as the foundation and based on its findings, Strategic Goals were developed. The plan underwent thorough review by the members mentioned in the notification, and the final draft was unanimously reviewed and approved.

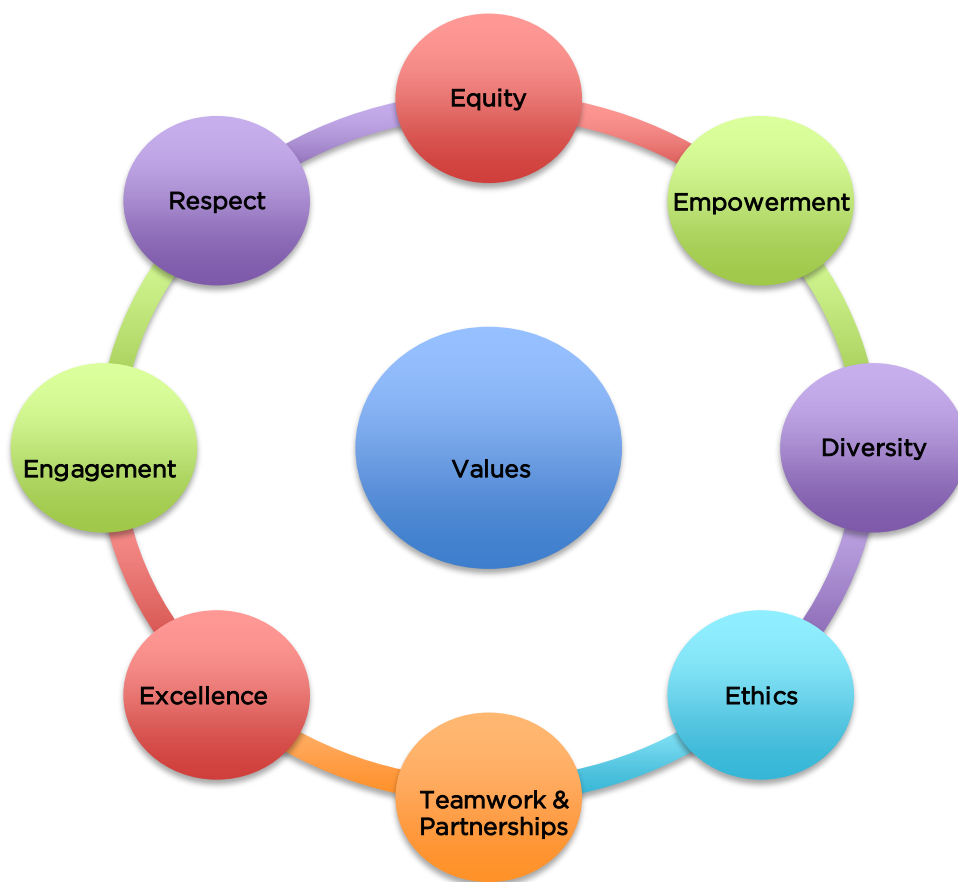
## SECTION II: VISION, MISSION & VALUES

### VISION

To be a pre-eminent academic institution committed to changing and saving lives.

### MISSION

Providing outstanding patient-centered education, training, and clinical care informed by cutting-edge research and innovation, generating and disseminating new knowledge.



## VALUES:

- **Customer Service**
  - Put students first
  
- **Empathy & Compassion**
  - Understand before you judge
  - Be concerned for the sufferings and misfortunes of others
  
- **Excellence**
  - Be the best and commit to exceptional quality and service
  
- **Innovation**
  - Encourage curiosity, imagine, create, and share
  
- **Teamwork**
  - Engage and collaborate
  
- **Integrity & Leadership**
  - Be a role model and influence others to achieve their best
  - Have the courage to do the right thing
  - Hold yourself and others accountable
  
- **Respect & Collegiality**
  - Be kind
  - Listen to understand
  - Value different opinions

## STATEMENT OF PURPOSE

To strengthen Sindh's public health response, PPHL focuses on detecting and combating infectious diseases, as well as emerging and reemerging health threats through advanced diagnostics and cutting-edge research.

### SECTION III: ASPIRATIONAL INSTITUTIONS

- National Institutes of Health Islamabad,
- Dow Diagnostic Research and Reference Laboratory
- The Aga Khan University Hospital Labs
- Public Health Lab, England
- International Diagnostic Standards (CAP Accredited)

## SECTION IV: STRATEGIC GOALS

### Goal 1: Enhance Early Detection and Diagnostic Response

**Objective 1:** Expand the scope of advanced diagnostics for emerging infectious diseases.

### Goal 2: Strengthen Disease Surveillance and Antimicrobial Resistance Monitoring:

**Objective 1:** To establish advanced surveillance systems for priority diseases by leveraging AI and advanced technology.

**Objective 2:** To implement AMR-Monitoring programs.

### Goal 3: Promote Research and Innovation in Public Health

**Objective 1:** To conduct research on priority public health challenges.

**Objective 2:** Develop new diagnostic tools and assays.

### Goal 4: Build Workforce Capacity and Professional Development

**Objective 1:** Provide continuous professional development for staff.

### Goal 5: Expand Public Health Outreach and Accessibility

**Objective 1:** To deploy mobile laboratories to improve surveillance in underserved regions.

### Goal 6: Establish Strategic Partnerships and Collaborations:

**Objective 1:** To build partnerships with global and public health organizations.

**Objective 2:** To strengthen local inter-departmental collaborations.

### Goal 7: Promote Data-Driven Decision-Making:

**Objective 1:** To leverage comprehensive data analysis, AI technology, and reporting to support evidence-based policymaking and enhance public health outcomes.

**Goal 8: Develop an Integrated Public Health Laboratory Network**

**Objective 1:** To create a unified network of public health labs.

**Goal 9: Ensure Quality Assurance and Biosafety Standards:**

**Objective 1:** To enhance quality assurance in laboratory practices and strengthen biosafety measures.

## OBJECTIVES, OKRs & KPIs

Goal 01: Enhance Early Detection and Diagnostic Response							
Goal Statement: Strengthen early detection of infectious diseases and emerging health threats through advanced molecular diagnostics and innovative technologies.							
Objectives & Key results (OKRs)							
Objective 1: Expand the scope of advanced diagnostics for emerging infectious diseases							
Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
Expand the scope of advanced diagnostics for emerging infectious diseases	KR 1.1: Introduce 100 new molecular tests.	KPI 1.1: Number of new assays introduced and validated.	Count of newly developed and validated assays.	100 new tests	Staff at the PPHL section	Additional lab equipment, reagents, and software tools	1 year
	KR 1.2: Detect and confirm outbreaks within 48 hours of initial reports.	KPI 1.2: Average time to confirm outbreaks.	Time tracking from initial report to confirmation.	≤ 48 hours	Staff at the PPHL section	Enhanced surveillance tools, trained epidemiologists, real-time data systems	6 months

Goal 02: Strengthen Disease Surveillance and Antimicrobial Resistance Monitoring							
Goal Statement: Develop and implement robust surveillance systems to monitor disease patterns, track outbreaks, and address AMR.							
Objectives & Key results (OKRs)							
Objective 1: To establish advanced surveillance systems for priority diseases by leveraging AI and advanced technology.							
Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To establish advanced surveillance systems for priority diseases by leveraging AI and advance technology.	KR 1.1: Established surveillance for priority diseases	KPI 1.1: Number of diseases under active surveillance.	Count of diseases actively monitored through AI-based surveillance.	10 diseases	Staff at PPHL section	AI-based analytics tools, trained personnel, data integration systems	2.5 years
	Report surveillance data within standard timelines using AI tools	Surveillance reports submitted	Number of reports submitted on time using AI-generated insights.	100% compliance with reporting standards	Staff at PPHL section	Data processing infrastructure, AI software, cloud storage	3 months



**Objective 2: To implement AMR-Monitoring programs.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To implement AMR-Monitoring programs.	KR 2.1: Developing an AMR database	KPI 2.1: Completion and operational status of the AMR database.	Database development and launch	Fully functional AMR database	Staff at the PPHL section	IT infrastructure, database management software, and skilled bioinformatics staff	1 year

**Goal 03: Promote Research and Innovation in Public Health**

**Goal Statement: Advance cutting-edge research to address critical public health challenges, focusing on zoonotic, emerging, and vaccine-preventable diseases.**

**Objectives & Key results (OKRs)**

**Objective 1: To conduct research on priority public health challenges.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To conduct research on priority public health challenges.	KR 1.1: Publish 5 peer-reviewed articles on zoonotic or vaccine-preventable diseases	KPI 1.1: Number of articles published in indexed journals.	Number of articles published in indexed journals.	5 articles	Staff at the PPHL section	Research funding, access to scientific databases, and collaboration with institutions	1 year
	KR 1.2: Secure research grants	KPI 1.2: Total grants secured.	Total grants secured.	At least 2 research grants	Manager & Faculty	Grant writing support, institutional partnerships, and financial management resources	1 year

**Objective 2: Develop new diagnostic tools and assays.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
Develop new diagnostic tools and assays.	KR 2.1 Validate 3 in-house diagnostic assays (LAMP, multiplex PCR)	KPI 2.1 Number of validated diagnostic assays.	Number of validated diagnostic assays.	3 assays	Staff at PPHL section	Laboratory reagents, validation protocols, specialized equipment	1 year

**Goal 04: Build Workforce Capacity and Professional Development**

**Goal Statement: Enhance the skills of public health professionals through continuous training in diagnostics, biosafety, and data analytics.**

**Objectives & Key results (OKRs)**

**Objective 1: Provide continuous professional development for staff**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
Provide continuous professional development for staff	KR 1.1: Conduct 12 training sessions annually in advanced diagnostics and biosafety	KPI 1.1: Number of training sessions conducted	Training attendance records, session evaluations	12 sessions annually	Manager & Faculty	Training materials, expert trainers, venue logistics	1 year
	KR 1.2: Certify lab personnel in advanced diagnostic techniques within 6 months.	KPI 1.2: Number of certified personnel	Certification exams, skill assessment reports	Minimum 4 personnel certified	Manager & Faculty	Laboratory access, training modules, and evaluation tools	6 months

**Goal 05: Expand Public Health Outreach and Accessibility**

**Goal Statement: Deploy mobile lab and innovative service models to conduct surveillance and healthcare services to underserved and remote areas.**

**Objectives & Key results (OKRs)**

**Objective 1: To deploy mobile laboratories to improve surveillance in underserved regions.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To deploy mobile laboratories for improving surveillance in underserved regions.	KR 1.1: Cover 15 remote areas annually with diagnostic services.	KPI 1.1: Number of regions served by mobile labs.	Field reports, service records from mobile labs	15 remote areas annually	Staff at PPHL section	Mobile lab units, diagnostic kits, trained personnel	1 year
	KR 1.2: Increase detection rates in underserved areas	KPI 1.2: Percentage increase in disease detection rates	Surveillance data analysis, comparative disease detection reports	Minimum 20% increase in detection rates	Staff at PPHL section	Data analytics tools, community outreach support	1 year

**Goal 06: Establish Strategic Partnerships and Collaborations**

**Goal Statement: Build and strengthen partnerships with national and international organizations to advance public health initiatives and foster knowledge-sharing.**

**Objectives & Key results (OKRs)**

**Objective 1: To build partnerships with global and public health organizations.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To build partnerships with global and public health organizations.	KR 1.1: Sign new MOUs with international partners	KPI 1.1: Number of MOUs signed.	Review of signed agreements and partnerships	3 new MOUs with international partners	Management	Legal and administrative support, negotiation teams	3 years

**Objective 2: To strengthen local inter-departmental collaborations.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To strengthen local inter-departmental collaborations.	KR 2.1: Establish monthly meetings with departments.	KPI 2.1: Number of meetings held.	Meeting minutes, attendance records	12 meetings per year	Management	Conference facilities, coordination team	Monthly
	KR 2.2: Share surveillance data with stakeholders.	KPI 2.2: Percentage of stakeholders receiving data.	Reports, acknowledgment from stakeholders	100% of relevant stakeholders receiving data	Management	Data sharing platforms, IT infrastructure	Weekly

Goal 07: Promote Data-Driven Decision-Making							
Goal Statement: Use comprehensive data analysis and reporting to support evidence-based policymaking and improve public health outcomes.							
Objectives & Key results (OKRs)							
Objective 1: To leverage comprehensive data analysis, AI technology, and reporting to support evidence-based policymaking and enhance public health outcomes.							
Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To leverage comprehensive data analysis, AI technology, and reporting to support evidence-based policymaking and enhance public health outcomes.	KR 1.1: Develop 4 predictive models of emerging diseases using AI tools	KPI 1.1: Number of predictive models developed.	Model validation and testing reports	4 predictive models developed	Manager	AI software, data analysts, computational resources	2 years
	KR 1.2: Launch an online dashboard for real-time data access	KPI 1.2: Operational status of the online dashboard.	System functionality testing, user access reports	Fully operational online dashboard	Management and other stakeholders	IT infrastructure, software development team	3 months

Goal 08: Develop an Integrated Public Health Laboratory Network							
Goal Statement: Create a connected network of public health laboratories across Sindh to streamline diagnostics, enable efficient data sharing, and foster collaborative disease control efforts.							
Objectives & Key results (OKRs)							
Objective 1: To create a unified network of public health labs.							
Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To create a unified network of public health labs.	KR 1.1: Connecting district laboratories through a centralized platform	KPI 1.1: Number of labs integrated into the network.	System integration reports, number of connected labs	All district labs integrated	Management and other stakeholders	IT infrastructure, network connectivity, training programs	2 years
	KR 1.2: Conduct monthly virtual meetings with all networked labs.	KPI 1.2: Number of virtual meetings held.	Meeting logs, attendance records	12 virtual meetings per year	Management and other stakeholders	Video Conferencing platform, coordination team	Quarterly

**Goal 09: Ensure Quality Assurance and Biosafety Standards**

**Goal Statement: Implement rigorous quality assurance protocols and biosafety measures to uphold excellence and safety in laboratory practices.**

**Objectives & Key results (OKRs)**

**Objective 1: To enhance quality assurance in laboratory practices and strengthen biosafety measures.**

Objective	Key Results	KPI	Measurement Method	Target	Person Responsible	Resource Requirement	Timeline
To enhance quality assurance in laboratory practices and strengthen biosafety measures.	KR 1.1: Pass external quality audits.	KPI 1.1: Number of audits passed.	Audit reports	100% compliance with external audits	All PPHL staff	Third-party auditors, compliance checklists	1 year
	KR 1.2: Conduct internal quality reviews quarterly.	KPI 1.2: Number of internal quality reviews conducted.	Internal review reports	4 reviews per year	Management	Quality control team, review framework	4 months
	KR 1.3: Achieve ISO 15189 certification.	KPI 1.3: Achieving ISO 15189 certification	Certification assessment	Certification achieved	All PPHL staff	Training programs, documentation preparation	1 year
	KR 1.4: Staff training in biosafety, biosecurity/ cyber biosecurity.	KPI 1.4: Number of staff trained in biosafety/ biosecurity	Training logs, attendance records	100% of relevant staff trained	Management	Training materials, expert trainers	6 months

## SECTION V: RESOURCE PLANNING FOR ACHIEVING STRATEGIC GOALS

PPHL prioritizes sustainable resource management to fulfill its public health mission. Key strategies include:

- Prioritize based on long-term goals, urgent needs, and growth areas.
- Maximize efficiency through automation, redundancy reduction, and quality assurance.
- Collaborate with government, private sector, and academia for resource sharing and joint projects.
- Explore diverse funding sources, including grants, donations, and partnerships.
- Foster innovation, develop cost-effective solutions, and invest in revenue-generating programs.

These strategies will enhance PPHL's diagnostic, research, and public health capabilities to improve healthcare outcomes in Sindh.

## **SECTION VI: IMPLEMENTATION & MONITORING OF THE STRATEGIC PLAN**

For a strategic plan to drive meaningful outcomes, effective implementation and monitoring are essential. To ensure its dynamic execution, PPHL will develop an appropriate monitoring framework to evaluate the progress of the plan in a timely and systematic manner.

Quarterly meetings will be conducted with committee members to review progress, address challenges, and align efforts with strategic goals. Comprehensive progress reports will be submitted to higher authorities for accountability and guidance. Transparency and merit will remain central to all processes, and efforts will focus on establishing a dedicated unit within PPHL to oversee the monitoring and evaluation of the strategic plan's implementation.

## SECTION VII: LIST OF APPENDICES

No.	DESCRIPTION
A	SWOT Analysis
B	TOWS Matrix
C	Publications
D	List of Existing Research Projects



## APPENDIX A: SWOT ANALYSIS

STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> <li>1. The lab boasts a team of skilled professionals with expertise in various fields of public health.</li> <li>2. Hi-Tech and latest equipment.</li> <li>3. Effective LIS software.</li> <li>4. Supportive leadership.</li> <li>5. Situated in a central location within the province, facilitating easy access and coordination with other health facilities.</li> </ol>	<ol style="list-style-type: none"> <li>1. Procurement issues (delay in kits availability from the store and finance).</li> <li>2. Budgeting issue from Dow Finance</li> <li>3. The old infrastructure building has persistent issues with fungal and bacterial growth, along with Termite growth on wood and walls.</li> </ol>
OPPORTUNITIES	THREATS
<ol style="list-style-type: none"> <li>1. Establishment of effective marketing strategies.</li> <li>2. Implementing training programs for staff to enhance skills and stay updated with the latest developments in the field.</li> <li>3. Exploring avenues for additional funding through grants and partnerships to invest in infrastructure upgrades and resource expansion.</li> <li>4. Ability to generate revenue.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discontinuation of Funding.</li> <li>2. Potential budget cuts or funding reductions that could further strain resources and affect service delivery.</li> </ol>

## APPENDIX B: TOWS MATRIX

	OPPORTUNITIES	THREATS
	<ol style="list-style-type: none"> <li>1. Establishment of effective marketing strategies.</li> <li>2. Implementing training programs for staff to enhance skills and stay updated with the latest developments in the field.</li> <li>3. Exploring avenues for additional funding through grants and partnerships to invest in infrastructure upgrades and resource expansion.</li> <li>4. Ability to generate revenue.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discontinuation of Funding.</li> <li>2. Potential budget cuts or funding reductions that could further strain resources and affect service delivery.</li> </ol>
STRENGTHS	SO	ST
<ol style="list-style-type: none"> <li>1. The lab boasts a team of skilled professionals with expertise in various fields of public health.</li> <li>2. Hi-Tech and latest equipment.</li> <li>3. Effective LIS software.</li> <li>4. Supportive leadership.</li> <li>5. Situated in a central location within the province, facilitating easy access and coordination with other health facilities.</li> </ol>	<ol style="list-style-type: none"> <li>1. Leverage expertise: Use skilled professionals to implement training programs and enhance staff skills.</li> <li>2. Marketing: Utilize the central location to develop marketing strategies that attract more clients and generate revenue.</li> <li>3. LIS software: Optimize LIS software to improve service efficiency and streamline operations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Mitigate funding disruption: Use skilled professionals and leadership to attract new funding sources and handle budget cuts.</li> <li>2. Leadership for resilience: Leverage supportive leadership to develop contingency plans and secure alternative revenue.</li> </ol>

WEAKNESSES	WO	WT
<ol style="list-style-type: none"> <li>1. Procurement issues (delay in kits availability from the store and finance).</li> <li>2. Budgeting issue from Dow Finance</li> <li>3. The old infrastructure building has persistent issues with fungal and bacterial growth, along with Termite growth on wood and walls.</li> </ol>	<ol style="list-style-type: none"> <li>1. Seek external funding: Use grants and partnerships to address procurement delays and budgeting issues.</li> <li>2. Infrastructure upgrades: Use funding to renovate the old infrastructure, addressing fungal, bacterial, and termite issues.</li> <li>3. Internal process training: Implement training to improve procurement management and financial handling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Infrastructure improvements: Prioritize urgent renovations to prevent safety risks from infrastructure issues.</li> <li>2. Streamline procurement: Improve internal systems to address delays in kit availability and avoid disruption.</li> <li>3. Cost-efficiency: Implement cost-cutting measures to navigate potential budget cuts.</li> </ol>

## APPENDIX C: PUBLICATIONS

- Decoding Mpox and Its Mimics, Insights from Provincial Public Health Lab, Sindh (manuscript submitted)

## APPENDIX D: LIST OF EXISTING RESEARCH PROJECTS

1. Molecular Investigation of Increasing Trend of HIV and its drug resistance in Sindh for Better Management and Treatment (VCFI).
2. Integrating Genomic Data into Patient Care: Whole Genome Sequencing of CHIKV and DENV for Improved Health Outcomes (VCFI)