Detailed Stage Reports for Smart City Digital Infrastructure Project

Stage 1 Report: Infrastructure Setup & Initial Development

Executive Summary

Stage 1 has been successfully completed with all major deliverables achieved within budget and timeline. The IoT sensor network is fully operational, collecting real-time data across Metro City. Initial data analytics framework shows promising results with measurable improvements in traffic monitoring capabilities.

Financial Report - Stage 1

Category	Allocated (ETH)	Spent (ETH)
Total	**6**	**5.85**
IoT Sensor Procurement & Installation	3.5	3.45
Backend Infrastructure Development	1.5	1.48
Project Management & Team Setup	1.0	0.92

Detailed Expenditure Breakdown:

- **IoT Sensor Procurement & Installation: 3.45 ETH** (Target: 3.5 ETH)
  - Hardware procurement (500 sensors): 2.8 ETH
  - Installation labor and equipment: 0.5 ETH
  - Network setup and configuration: 0.15 ETH
- **Backend Infrastructure Development: 1.48 ETH** (Target: 1.5 ETH)
  - Cloud server setup (AWS): 0.6 ETH
  - Database infrastructure: 0.3 ETH
  - API development: 0.4 ETH
  - Security implementation: 0.18 ETH
- **Project Management & Team Setup: 0.92 ETH** (Target: 1.0 ETH)
  - Project manager salary (6 months): 0.5 ETH
  - Technical lead setup: 0.25 ETH
  - Documentation and compliance: 0.1 ETH
  - Administrative costs: 0.07 ETH

Technical Achievements - Stage 1

IoT Sensor Network Deployment:

- **Total Sensors Installed:** 500/500 (100% complete)
- **Sensor Types Deployed:**
  - Traffic monitoring sensors: 200 units
  - Environmental sensors (air quality): 150 units
  - Noise monitoring sensors: 100 units
  - Emergency detection sensors: 50 units

Data Collection Performance:

- **Data Points Collected Daily:** 2.4 million
- **System Uptime:** 99.2%
- **Data Accuracy Rate:** 97.8%
- **Network Coverage:** 95% of target areas

Infrastructure Specifications:

Cloud Infrastructure:

- Primary Servers: 3x AWS EC2 instances (t3.large)
- Database: PostgreSQL cluster with 99.9% uptime SLA
- Storage: 50TB distributed storage system
- Backup: Real-time replication across 2 availability zones
- Security: SSL encryption, VPN access, role-based authentication

Network Architecture:

- Primary Communication: LoRaWAN for sensors
- Backup Communication: 4G/5G cellular
- Data Processing: Edge computing nodes (10 locations)
- Latency: Average 150ms response time

Performance Metrics - Stage 1

- Traffic Flow Monitoring: 35% improvement in data accuracy vs. previous systems
- Environmental Data: Real-time air quality index available for 90% of city areas
- Emergency Response Integration: 25% faster incident detection
- System Reliability: 99.2% uptime achieved (target: 99%)

Challenges Overcome - Stage 1

- Weather-related Installation Delays: Resolved through flexible scheduling
- Network Connectivity Issues: Solved with hybrid LoRaWAN/cellular approach
- Data Format Standardization: Implemented universal data schema
- Cybersecurity Concerns: Enhanced with additional encryption layers