

# VIII. Performance Analysis

## *Public Transport Planning and Regulation: An Introduction*



# Planning and Analysis Building Blocks



Schedule Building	Cost Analysis and Financial Planning
<b>Performance Analysis</b> <div style="float: right; border: 1px solid black; background-color: #00FF00; padding: 2px;">Focus of Discussion</div>	
Measures & Standards	Service Monitoring and Data Collection
Network and Route Design	Fares and Revenue: Policy, Analysis, and Collection
Market Factors and Demand Analysis	Terminology and Basic Relationships





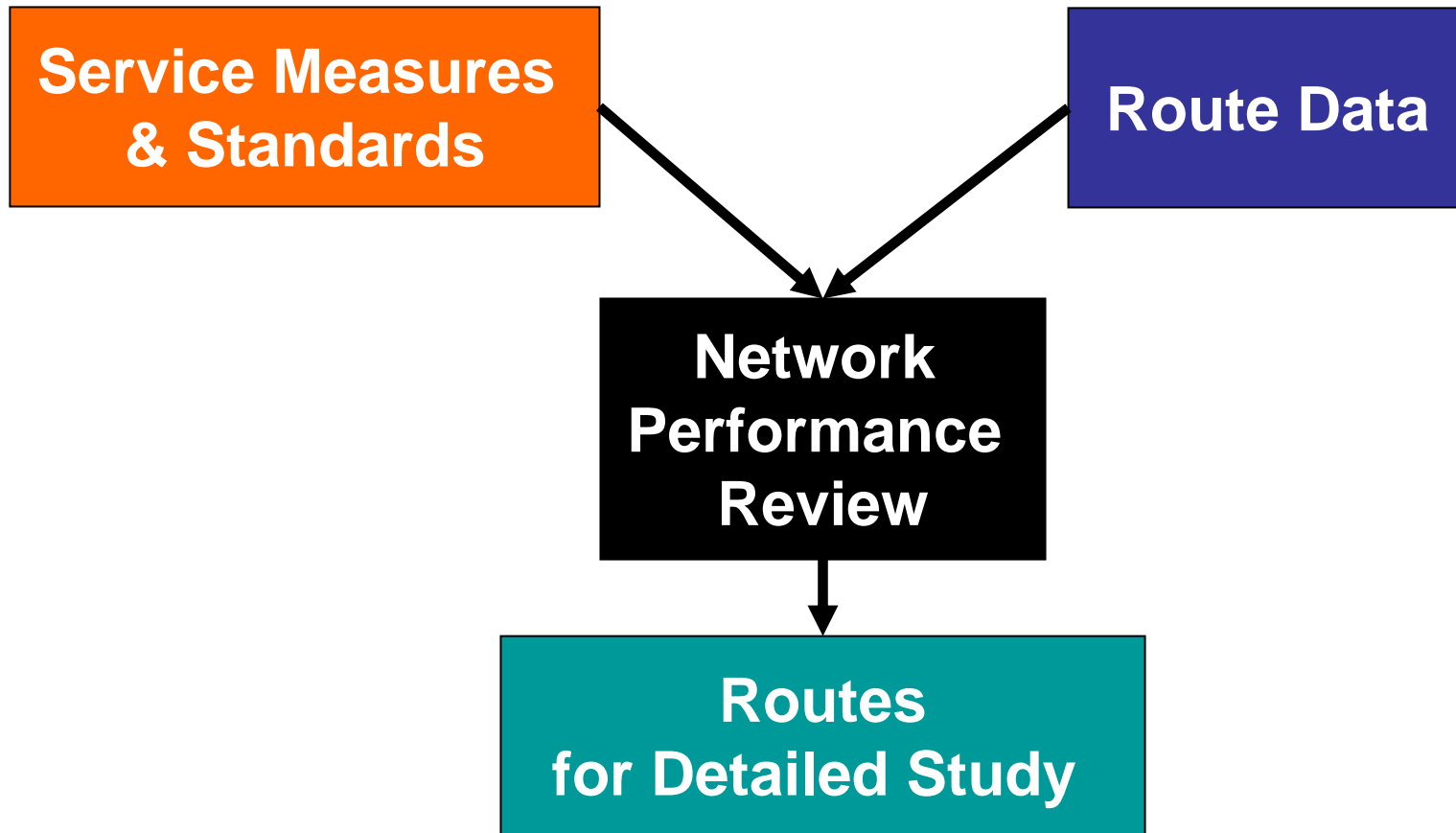
# Performance Analysis Should Be Ongoing and Systematic

- **Frequency and Approach**
  - **Regular review of all bus routes**
    - *Strongly suggested* every service schedule change
  - **Detailed study of selected routes**
    - Routes with substandard performance
    - Routes serving areas with major market changes
  - **All routes should be examined in detail every 2-3 years**





# Network Performance Review





# Each Route Is Considered a “Separate Product”

- Routes serve different travel markets
- Routes operate in different environments
- *However, do not forget that routes work together to form a network!*



# Common Service Problems<sup>1</sup>

- **Low profitability/high subsidies**
  - **Low usage, low fares, high costs**
- **Unreliable service**
  - **Late trips, missed trips**
- **Inadequate capacity**
  - **Crowding, pass-by's**
- **Declining travel speed**
- **Inconvenient transfers**
  - **Too many, poor coordination**
- **Poor safety**
  - **High number of accidents**



<sup>1</sup> *Perceived Problems, Evaluate Your Bus System, Urban Bus Toolkit* VIII-6





# Typical Service Measures

<b>Problem</b>	<b>Measure</b>
<b>Low Profitability/ High Subsidies</b>	<b>Passenger Revenue per Kilometer</b> <b>Passengers per Kilometer</b> <b>Cost per Kilometer</b> <b>Operating Ratio</b>
<b>Unreliable Service</b>	<b>Percent Missed Trips</b> <b>Percent Trips On-Time</b>
<b>Inadequate Capacity</b>	<b>Passengers per Bus at the Maximum Load Point</b>
<b>Declining Travel Speed</b>	<b>Transit Speed as a Percent of Auto Speed</b>
<b>Inconvenient Transfers</b>	<b>Percent Passengers Transferring</b>
<b>Poor Safety</b>	<b>Accidents per 100,000 KM</b>



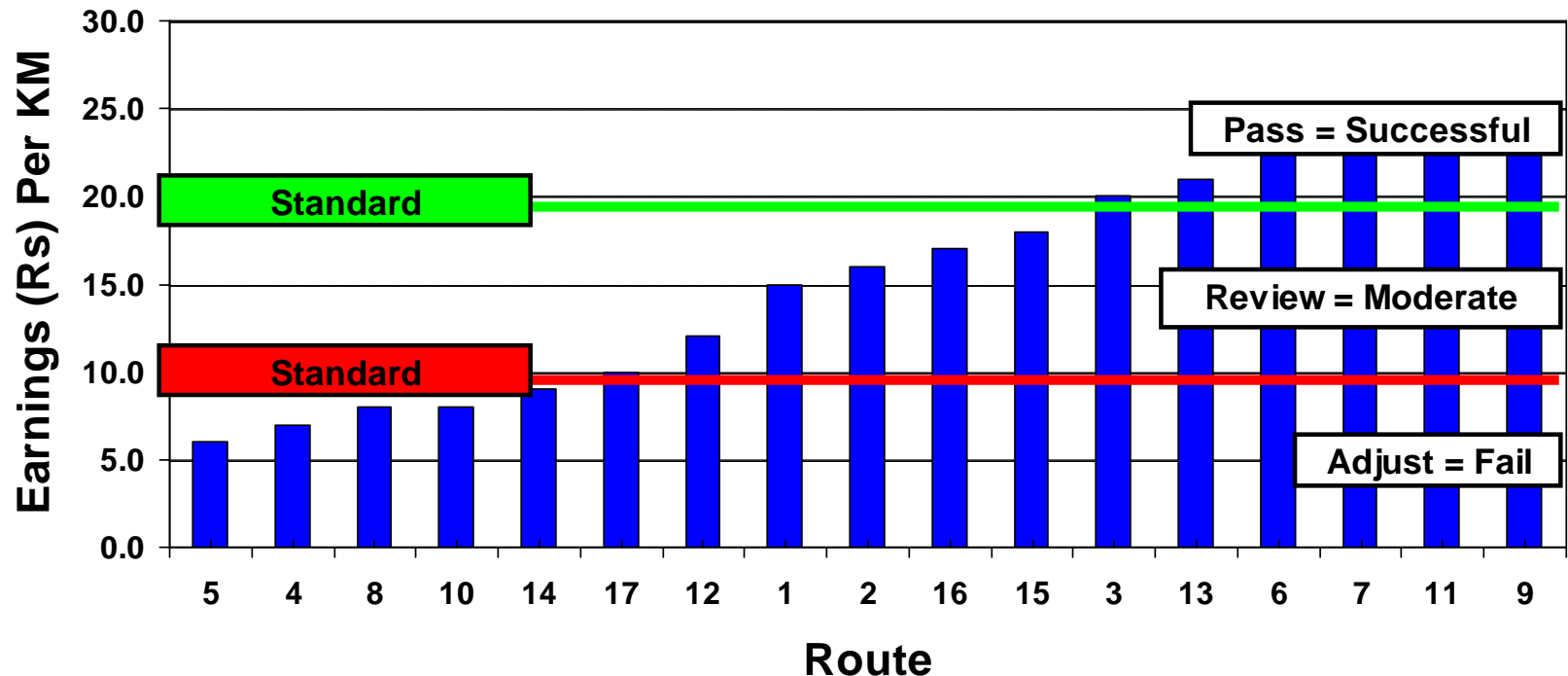


# Select Routes for Detailed Analysis

- Performance of individual routes are ranked according to key measures
- Routes not meeting the performance standards after detailed analysis



# Example of Performance Ranking



Bangalore Metropolitan Transport Corporation "ABC" Route Evaluation





## Detailed Study of Selected Routes

- **Two analysis dimensions**
  - **Time period**
    - Time-of-day
    - Day-of-week
  - **Route segment**
- **Can combine the two dimensions**
  - **Time period/route segment**



# Time Period Analysis

- **Time-of-day/day-of-week breakdown of route performance**
- **Average performance analyzed by operating period**





# Steps in Time Period Analysis *Capacity Example*

1. Obtain *passengers at maximum load point* and *vehicle capacities* by vehicle trip.
2. Define analysis operating periods.
3. Sum *passengers at maximum load point* and *vehicle capacities* by operating periods.
4. Compute *percent capacity used* by operating period.
5. Assess results compared to performance standard





# 1. Obtain Data by Vehicle Trip

Arrival Time	Pass. @ Max. Load Pt.	Pass Capacity
7:05 AM	36	76
7:10 AM	44	76
7:15 AM	46	76
7:20 AM	52	76
7:25 AM	56	76
7:30 AM	76	76
7:35 AM	89	76
7:40 AM	95	76
7:45 AM	101	76
7:50 AM	88	76
7:55 AM	56	76
8:00 AM	53	76



# 2. Define Analysis Operating Periods

Arrival Time	Pass. @ Max. Load Pt.	Pass Capacity	Analysis Period
7:05 AM	36	76	1
7:10 AM	44	76	
7:15 AM	46	76	
7:20 AM	52	76	2
7:25 AM	56	76	
7:30 AM	76	76	
7:35 AM	89	76	3
7:40 AM	95	76	
7:45 AM	101	76	
7:50 AM	88	76	4
7:55 AM	56	76	
8:00 AM	53	76	



# 3. Sum Data by Operating Periods

Arrival Time	Pass. @ Max. Load Pt.	Pass Capacity	Analysis Period	Pass. @ Max. Load Pt.	Pass Capacity
7:05 AM	36	76	1	126	228
7:10 AM	44	76			
7:15 AM	46	76			
7:20 AM	52	76	2	184	228
7:25 AM	56	76			
7:30 AM	76	76			
7:35 AM	89	76	3	285	228
7:40 AM	95	76			
7:45 AM	101	76			
7:50 AM	88	76	4	197	228
7:55 AM	56	76			
8:00 AM	53	76			







# 4. Compute Percent Capacity Used

Arrival Time	Pass. @ Max. Load Pt.	Pass Capacity	Analysis Period	Pass. @ Max. Load Pt.	Pass Capacity	Percent of Capacity
7:05 AM	36	76	1	126	228	55%
7:10 AM	44	76				
7:15 AM	46	76				
7:20 AM	52	76	2	184	228	81%
7:25 AM	56	76				
7:30 AM	76	76				
7:35 AM	89	76	3	285	228	125%
7:40 AM	95	76				
7:45 AM	101	76				
7:50 AM	88	76	4	197	228	86%
7:55 AM	56	76				
8:00 AM	53	76				



# 5. Assess Results Versus Performance Standard

Arrival Time	Pass. @ Max. Load Pt.	Pass Capacity	Analysis Period	Pass. @ Max. Load Pt.	Pass Capacity	Percent of Capacity	Exceed Capacity?
7:05 AM	36	76	1	126	228	55%	
7:10 AM	44	76					
7:15 AM	46	76					
7:20 AM	52	76	2	184	228	81%	
7:25 AM	56	76					
7:30 AM	76	76					
7:35 AM	89	76	3	285	228	125%	
7:40 AM	95	76					
7:45 AM	101	76					
7:50 AM	88	76	4	197	228	86%	
7:55 AM	56	76					
8:00 AM	53	76					

**Assessment: More capacity needed between 7:35 AM and 7:45 AM**





# Segment Analysis

- **Breakdown of route performance by route segment**
- **Average performance analyzed by route segment**



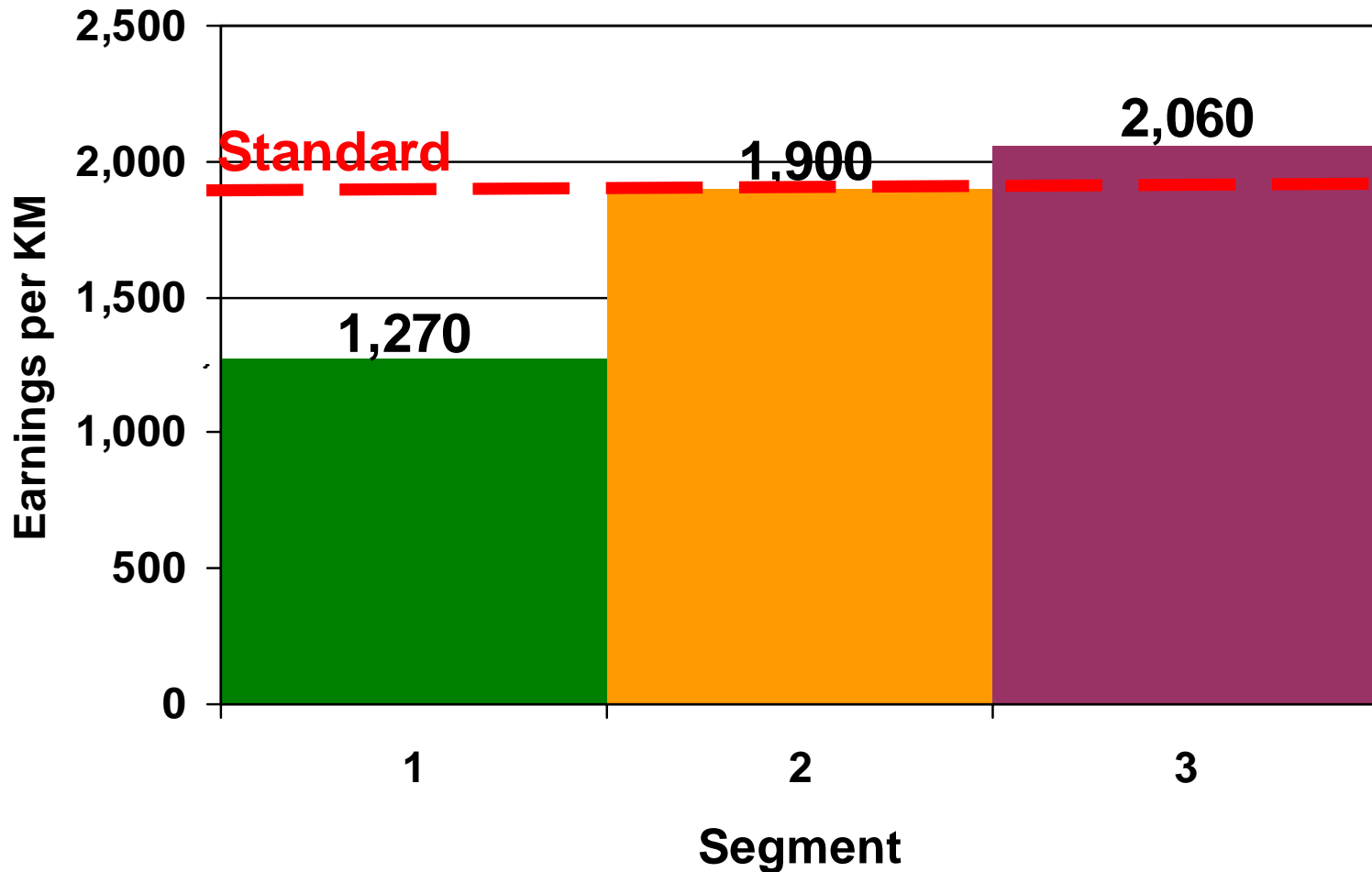
# Steps in Time Period Analysis

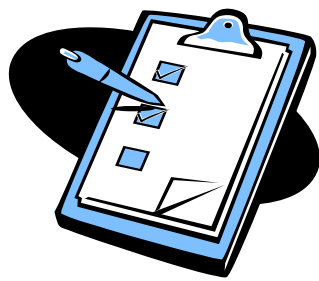
## *Earnings per KM Example*

1. Obtain *passenger revenues* by bus stop.
2. Define route segments.
3. Determine *passenger revenues* and *revenue KM* by segment
4. Compute *earnings per KM* by segment
5. Assess results compared to performance standard



# Segment Analysis Results





# Summary

- **Outlined common service problems**
  - **Low profitability/high subsidies**
  - **Unreliable service**
  - **Inadequate capacity**
  - **Declining travel speed**
  - **Inconvenient transfers**
  - **Poor safety**
- **Discussed two-phase analysis process**
  - **Comprehensive review of all routes**
  - **Detailed study of selected routes**
    - Time period, segment, combination of two
- ***Remember*, analysis should be systematic and the basis for potential improvements**

