

# FIVE STEPS FOR SUCCESSFUL REALIZATION OF ASSET VALUE

## CASE STUDY: SINGAPORE RTS INFRASTRUCTURE

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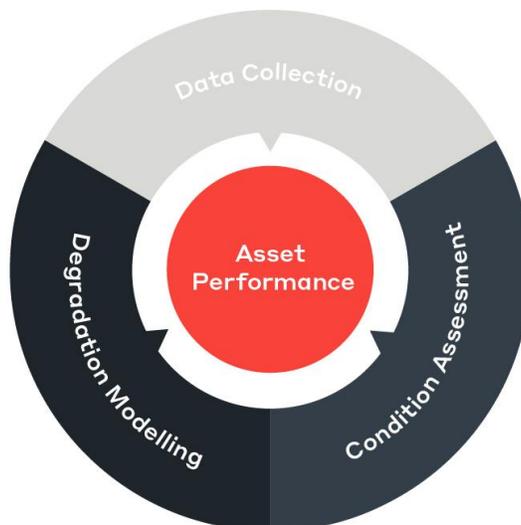
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MANY EUROPEAN RAILWAY SYSTEMS HAS BEEN IN OPERATION FOR DECADES AND HAVE BEEN SUBJECT TO INTENSIVE USE AND/ OR VARYING DEGREES OF MAINTENANCE. TO ENSURE THAT THESE NETWORKS REMAIN CAPABLE OF HANDLING THEIR INCREASINGLY IMPORTANT TASK AND EVER-INCREASING PASSENGER TRANSPORTATION LOAD, IT IS ABSOLUTELY FUNDAMENTAL TO IMPLEMENT A COST-EFFICIENT STRATEGY FOR MAINTAINING EACH SYSTEM WITH MINIMUM IMPACT ON OPERATIONS.

Asset Management, as defined in ISO 55000, is the coordinated activity of an organization to realize value from assets, which will normally involve balancing costs, risks, opportunities and performance benefits.

Accurate information about asset performance is fundamental to asset management, providing a basis upon which the organization coordinates and manages its asset management objectives. For successful asset management, WSP in Sweden considers three areas key to determining asset performance: Data Collection, Condition Assessment and Degradation Modelling. The outcome of these three activities is accurate and up-to-date asset performance data upon which to base asset management.

Figure 1. Asset Performance



**Data Collection** refers to the activities of collecting asset data on a level deemed appropriate for ascertaining asset condition, both by physical assessment and as a desktop exercises based on available data and gaps. Asset data is not limited to the “as-is” state of system components, but rather also includes data on the management of assets, including maintenance processes, work instructions and high-level managerial intent.

**Condition Assessment** is an asset condition scoring exercise accounting for risk and asset criticality. This exercise is performed using the collected data to ascertain the “as-is” condition of assets on an overall level in comparison to the baseline condition. Once the condition of the system has been established, condition assessment becomes the continuous process of assessing the assets to keep track of changes in their condition.

**Degradation Modelling** establishes the asset’s condition in comparison to the expected progress of asset degradation based on a multitude of internal and external factors such as asset life, fault rates and climate. Degradation modelling allows for the benchmarking of asset conditions against one another and against business best practice, as well as the prediction of future asset conditions for planning and investment purposes.

## CASE STUDY: CONDITION ASSESSMENT OF RTS INFRASTRUCTURE IN SINGAPORE



Figure 2. Singapore RTS Infrastructure

WSP has extensive experience in providing the services organizations need to set up and streamline their asset management. We have helped the US Federal Transit Administration develop the Asset Management Guide for the world’s largest condition assessment, performed data collection and integration of all metro assets in Sweden, and developed strategic asset management plans for various clients in Canada, the UK and the US, among others. Furthermore, WSP in Sweden, together with WSP in Singapore, has just concluded a complete condition assessment of civil and permanent way assets, with related services, for RTS infrastructure in Singapore, as contracted by the Singapore Land Transport Authority (LTA).

The Singapore RTS Infrastructure, which began operating in the late 1980s, is well known to provide world-class service with a high degree of punctuality, cleanliness and reliability. However, the older parts of the network could now be said to be approaching their technical and financial end-of-life, and are starting to show signs of age. The main operator has seen a 20% rise in maintenance-related operating expenses since 2014, and has identified asset management as one of its key focus areas.

The objective of the Singapore project was to establish the baseline condition, being the current asset status, as the starting point for asset management. The services we provided included data collection, condition assessment, degradation modelling, a program for rectification of degraded assets, review and proposal of maintenance plans, and strategic and financial advice for all stations, depots, tunnels, viaducts and permanent way assets.

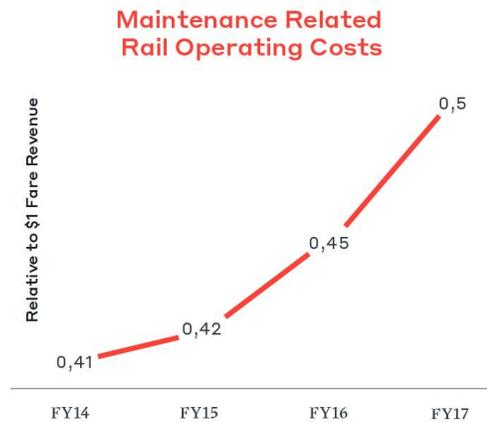


Figure 3. Maintenance Related Rail Operating Costs

## FIVE SIMPLE STEPS FOR SUCCESSFUL CONDITION ASSESSMENT

Experience has shown that five simple but equally important steps are instrumental in successful condition assessment: 1) Agree on Asset Hierarchy, 2) Establish the Assessment Scale, 3) Identify Weighting Parameters, 4) Evaluate Asset Condition, and 5) Apply Weighting and Aggregation.

These steps ascertain that asset condition is objectively determined and represented by numeric values suitable for SMARTER (Specific, Measurable, Attainable, Relevant, Timely, Evaluated and Reevaluated) KPI-tracking, based on reliability, availability, maintainability and safety objectives.

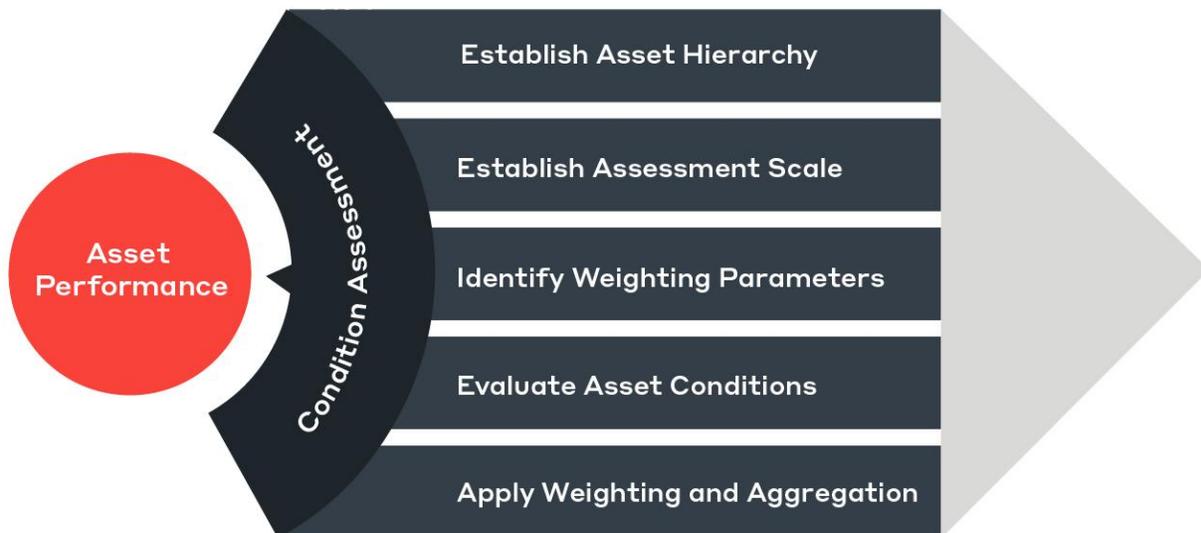


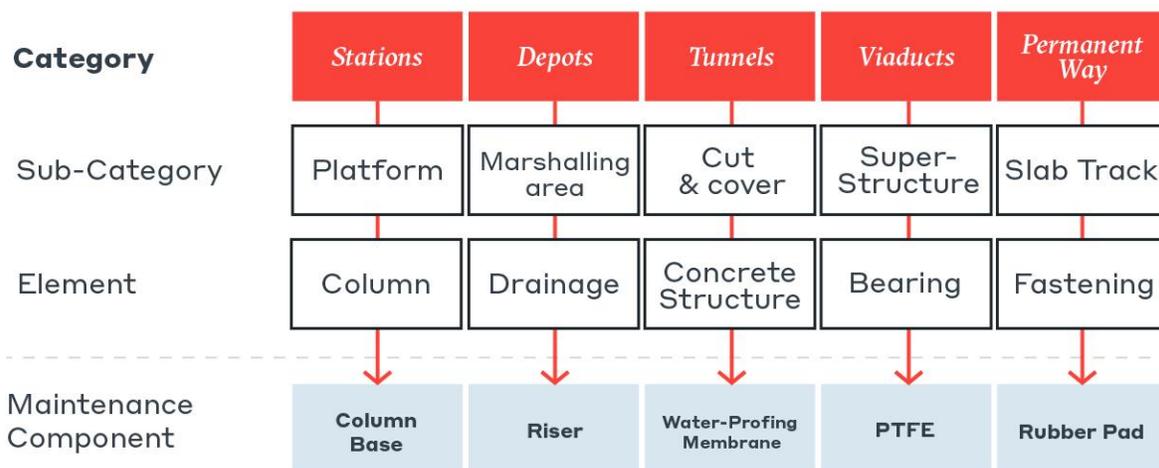
Figure 4. Five-Step Condition Assessment

## STEP ONE - AN ASSET HIERARCHY THAT REFLECTS HOW THE CLIENT IS STRUCTURED

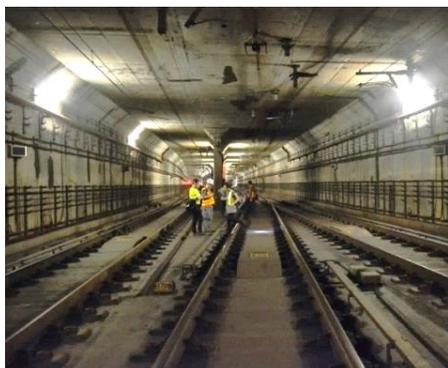
Asset hierarchy, which defines how the assets are interrelated, is agreed upon. The asset hierarchy guides the assessment toward the appropriate assets and determines their inter-relationship in accordance with the objectives of the client’s management. The approach is equally suitable for both civil assets as well as electrical and mechanical assets.

The organizations that manage operation and maintenance of rail infrastructure systems often divide assets into two categories sharing many of the same procedures and resources: Civil & Structures and Permanent Way. The applied asset hierarchy – and the overarching asset management system – is adapted to the organization and the infrastructure by identifying five distinct, high-level elements. Railway Civil & Structures is often subdivided into *Stations*, *Depots*, *Tunnels* and *Viaducts*. The hierarchy is set to a level of detail appropriate to the condition assessment at hand, mostly for CAPEX planning purposes.

### Condition Assessment Capital Planning



## STEP TWO - THE ASSESSMENT SCALE ENSURES RELIABILITY AND REPEATABILITY



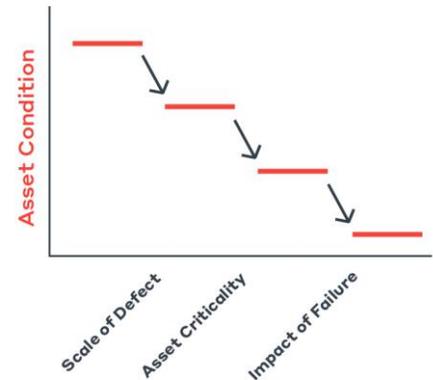
An assessment scale is established to provide the basis for asset scoring. We have found that a numerical scale with a limited number of increments is usually appropriate, providing for sufficient resolution yet retaining accuracy. Such a scale could be defined as, for instance, 1 = *total loss of function* to 5 = *asset as new*. A scale with too few increments risks losing its potential to provide value to the organization by not providing enough information for either maintenance or planning purposes, while too many increments will add to the scale’s ambiguity.

A numerical value is also determined for the minimum service level (MSL<sup>1</sup>) for all assets in relation to the established assessment scale, to ensure balance among operating and capital costs, risks and performance. Setting a high MSL reduces risks to the operation but entails higher costs, while a low MSL will increase the risk of critical failures in the network.

### STEP THREE - ASSETS ARE PUT INTO CONTEXT BY WEIGHTING

Weighting parameters are identified in order to put the condition of individual assets into the context of their respective environments. The Singapore RTS Infrastructure assets are weighted based on: Scale of Defect, Asset Criticality and Impact of Asset Failure. Scale of Defect is applied to account for the possibility of systematic faults within the system, while Asset Criticality ensures that the condition of the system is mainly based on those assets that are critical to system operation. Impact of Asset Failure is where management priorities affect the assessment of asset conditions by identifying the client's corporate risk profile.

In Singapore, as in many places, System Safety is set above all else, and any safety related issues are thus assigned a proportionally higher impact on the asset's overall condition.



### STEP FOUR - ASSET CONDITIONS ARE EVALUATED BY GUIDED EXPERIENCE

The asset condition evaluation is a strategic implementation of the scoring system to determine asset criticality as a means of optimising maintenance efforts. Asset condition is evaluated, and assigned a score in accordance with the established assessment scale, based on the unique circumstances under which the assets operate. The assessment is based on the experience of senior assessors guided by the assessment scale to ensure a high level of objectivity. Ideally,



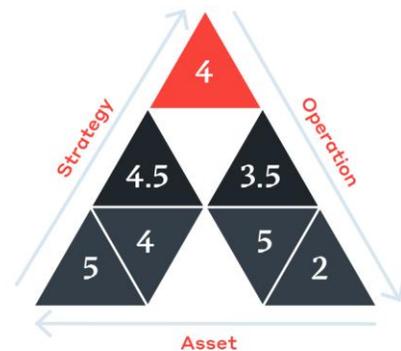
<sup>1</sup> The Minimum Service Level defines the condition at which the asset should be replaced or renewed.

all asset conditions and non-conformances are recorded in a database integrated with the corporate management system.

In Singapore, the approach in practice involved collecting overall asset data using advanced systems and software, hence making it readily available to experts in various fields – regardless of office affiliation – for evaluation and re-evaluation.

### STEP FIVE - WEIGHTING AND AGGREGATION ARE APPLIED TO COMPLETE THE ASSESSMENT

The appropriate weightings are applied to asset conditions, and scoring is aggregated through the hierarchy to arrive at an overall asset condition on each level represented by a numeric value. Aggregation of scoring from a detailed to a high level ensures total control at the right levels and allows for both operational and strategic decisions to be taken on the basis of asset-specific information.



## FROM A RUN-TO-FAILURE APPROACH TO AN INTEGRALLY CONNECTED INFRASTRUCTURE AND ORGANIZATION

Our Condition Assessment aligns with the ISO 55000 standard and provides organizations with the support and tools needed to implement an asset management plan based on accurate information. The Condition Assessment facilitates good coordination among departments at all levels of an organization for asset management in accordance with best practice. This is an instrumental step transforming from having a run-to-failure approach to realizing the real value of assets by optimization of the organizational framework, maintenance and finance processes as well as operations - being an integrally connected infrastructure and organization.

### CONTACT

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