When looking at railway planning, a discrepancy exists between planners who focus on the train operations and publish fixed railway schedules, and passengers who look not only at the schedules but also at the entirety of their trip, from access to waiting to on-board travel and egress. Looking into this discrepancy is essential, as assessing railway performances by merely measuring train punctuality would provide an unfair picture of the level of service experienced by passengers. Firstly, passengers’ delays are often significantly larger than the train delays responsible for the passengers to be late. Secondly, trains’ punctuality is often strictly related to too tight schedules that in turn might translate into knock-on delays for longer dwelling times at stations, trip delays for increased risk of missing transfer connections, and uncertain assessment of the level of service experienced, especially with fluctuating passenger demand. A key aspect is the robustness of railway timetables. Empirical evidence indicates that passengers give more importance to travel time certainty than travel time reductions, as passengers associate an inherent disutility with travel time uncertainty. This disutility may be broadly interpreted as an anxiety cost for the need for having contingency plans in case of disruptions, and may be looked at as the motivator for the need for delay-robust railway timetables. Interestingly, passenger-oriented optimisation studies considering robustness in railway planning typically limit their emphasis on passengers to the consideration of transfer maintenance. Clearly, passengers’ travel behaviour is far more complex and multi-faceted and thus several other aspects should be considered, as becoming more and more evident from passenger surveys. The current literature review starts by looking at the parameters that railway optimisation/planning studies are focused on and the key performance indicators that impact railway planning. The attention then turns to the parameters influencing passengers’ perceptions and travel experiences. Finally, the review proposes guidelines on how to reduce the gap between the operators’ railway planning and performance measurement on the one hand and the passengers’ perception of the railway performance on the other hand. Thereby, the conclusions create a foundation for a more passenger-oriented railway timetabling ensuring that passengers are provided with the best service possible with the resources available.