Abstract

The dimensioning of road surfaces is an essential prerequisite that guarantees a long-lasting and sustainable traffic infrastructure in any country. Characteristics like the climatic and topographic conditions as well as the heavy traffic provide the analytical basis and need to be addressed through a standardized approach for the dimensioning of road surfaces.

However, such a standardized approach which would allow for the systematic dimensioning of road surfaces does not yet exist for Afghanistan. Instead, the planning and construction of road surfaces in Afghanistan depend on the experiences of individual construction companies and foreign guidelines such as the AASHTO. On the one hand, this current approach leaves the processes of dimensioning and construction at a higher risk for miscalculations and defects due to the language barrier and communication problems. On the other hand, the heavy traffic loads and the characteristics of Afghanistan’s climate and geology cannot be considered regarding the load capacity of the subgrade.

With this dissertation, an approach for Afghanistan has been developed by employing the theoretical and technical basis of the German guideline for the standardized dimensioning of traffic surfaces, the RStO 12. This approach considers the characteristics of the local climate, topography and volume of heavy traffic that are specific to Afghanistan.

In order to determine the load factors specific to Afghanistan (load spectrum quotient $q_{Bm}$ and axle count factor $f_A$) from the local heavy traffic, a traffic count was conducted in Kabul. Moreover, the consulted satellite-based climate data were compared to existing climate data found in literature and could be verified. Based on these climate data, a map of frost action zones for the dimensioning of frost-proof superstructures was developed with a GIS application. Furthermore, load factors (lane factor $f_1$, lane width factor $f_2$, slope factor $f_3$) and the medium annual increment factor for heavy traffic $f_z$ were adapted for calculations with the dimensioning formula [DF]. Moreover, six load classes have been outlined for the different road construction types. These load classes can be selected and applied for roads in Afghanistan after the dimensioning formula has been calculated and the local characteristics have been considered.

The findings of this dissertation show that Afghanistan is characterized by very different climatic influences which are mandatory for the dimensioning of frost-proof superstructures. Moreover, the heavy traffic vehicles are characterized distinctive features concerning the axle loads and loading conditions which in turn demand a specific dimensioning process for the Afghan road surfaces. Thus, this dissertation establishes a relevant scientific basis for the development of standardized road and highway design concepts and for further research in road engineering in Afghanistan.