A number of waste life cycle assessment (LCA) models have been gradually developed since the early 1990s, in a number of countries, usually independently from each other. Large discrepancies in results have been observed among different waste LCA models, although it has also been shown that results from different LCA studies can be consistent. This paper is an attempt to identify, review and analyse methodologies and technical assumptions used in various parts of selected waste LCA models. Several criteria were identified, which could have significant impacts on the results, such as the functional unit, system boundaries, waste composition and energy modelling. The modelling assumptions of waste management processes, ranging from collection, transportation, intermediate facilities, recycling, thermal treatment, biological treatment, and landfilling, are obviously critical when comparing waste LCA models. This review infers that some of the differences in waste LCA models are inherent to the time they were developed. It is expected that models developed later, benefit from past modelling assumptions and knowledge and issues. Models developed in different countries furthermore rely on geographic specificities that have an impact on the results of waste LCA models. The review concludes that more effort should be employed to harmonise and validate non-geographic assumptions to strengthen waste LCA modelling.