The Architecture, Engineering and Construction industry has many times been criticized for lack of control and management of its environmental impacts. In an attempt to monitor and minimize these impacts, the method of Life Cycle Assessment is being used more and more often during the design process of construction projects. Nevertheless, the whole process of performing a building’s LCA is considered time consuming which sometimes prevents the design teams from using it more than once in the end of the design as a way to assess the impacts of their final design. The aim of this study is to suggest a method which will render LCA a design tool used during the whole design process. The study focuses not only in creating a tool that will be able to assess a building’s environmental impacts, but will also be an analysis tool which will help the design teams make the right decisions and help them minimize their design’s environmental impacts. To achieve this, this study evaluated the potential of integrating LCA into BIM, developed and proposed an Integrated Dynamic Model using Revit, Dynamo and Excel. The Integrated Dynamic model was used in case studies the results of which were compared with the respective ones from other established LCA software. The results showed that the integrated dynamic model can create results of equal quality and precision with other specialized software while demanding significantly less time. The ease of use of such an integrated dynamic model and the instant creation of results could render it a decision making tool in respect with LCA.