# Life Cycle Assessment of Dell PowerEdge R740

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From design to end-of-life and everything in between, we work to improve the environmental impact of the products you purchase. As part of that process, we estimate the specific impacts throughout the lifecycle. The lifecycle phases included in a LCA are illustrated in figure 1.


**LCA Definition**

'A life cycle assessment is the compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle' – *ISO 14040: 2006, sec 3.2.*

**Figure 1: 'Cradle to grave' Life Cycle Assessment phases**

The product selected for this LCA is the Dell R740 server and represents that of a general-purpose rack server which provides computing services capable of handling very demanding workloads and applications, such as data warehouses, ecommerce, AI/Machine Learning, and high-performance computing (HPC). The server configuration modelled in this LCA represents that of a high-end configuration (see table 1).

**Table 1: Assumptions**

| Assumptions | |
|---|---|
| Lifetime of product | 4 Years |
| Use location | EU & USA |
| Memory | x12 32GB DIMM's |
| Storage | x1 400GB SSD<br>x8 3.4TB SSD's |
| Processor | x2 Intel Xeon 140W CPU's |
| Platform | 2U, 2-socket platform |

## Results Summary

The impact assessment results within this study include but are not limited to; global warming potential (GWP), ozone layer depletion potential and eutrophication potential. The results discussed in this LCA focus on the GWP impact category as it is considered the most robust and widely used impact category. Climate change is also referred to as GWP or the 'carbon footprint'. A detailed view of the carbon footprint is shown in figure 1. The major fraction of the impact (approximately 98%) derives from the manufacturing and use phase of the Dell R740. Transportation and end of life management has a less relevant contribution to the overall impact of the Dell R740 server.

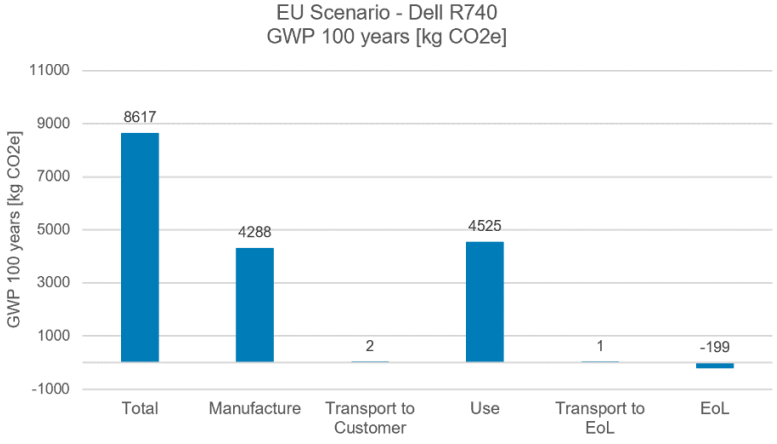


**Figure 1: Contribution of the different stages of the lifecycle to the GWP of the Dell R740 (EU)**


Dell PowerEdge R740

## Key Findings:

- *The use phase contributes to approx. 50% of the total life cycle global warming potential of the sever.*
- *The manufacturing stage contributes to approx. 50% of the product carbon footprint.*
- *Electronic components in the manufacturing stage have the largest environmental impact of all modules and are dominated by the x8 3.4TB SSD's. The manufacture of storage devices is complex and both energy and resource intensive.*
- *The majority of the SSD impact of the 3.84TB SSD's comes from the NAND flash chips. Results indicate that the die/package ratio of these chips significantly influences the GWP.*
- *The study scenarios assume three different die/package ratios of 30%, 60% and 80%. Overall manufacturing impacts of the server are reduced by ~40% if a die/package ratio of 30% is assumed for the SSD's.*
- *The two materials that are influenced by the different die/package ratios are the wafer manufacturing and gold.*
- *Recycling resulted in a net reduction of 200 kg CO2-equivalents. This represents a reduction of the total impact by around 1.8%.*
- *The largest net gains that come from recycling the Dell R740 server come from the recycling of gold (~84%), followed by steel (~10%).*

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As outlined in figure 1, the manufacturing of the Dell R740 contributes to approximately 50% to the total of the life cycle impact. The majority of the impacts come from the electronic components, particularly the eight 3.48TB SSD's (˜80%). Figure 2 shows that the majority of the impact of the 3.48TB SSD's comes from the NAND flash chips. The energy consumption, waste and emissions of their manufacture far outweigh the regular metallurgical or plastic production processes we see with other components such as the server chassis. This is especially the case for the associated complexity, high density and high capacity chips used in the SSD's.

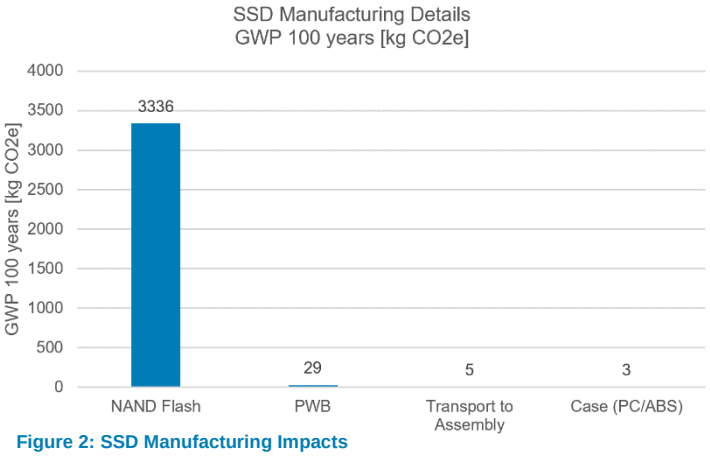


**Figure 2: SSD Manufacturing Impacts**

## Conclusion

The environmental impact from the manufacturing stage in this LCA is higher than typically expected of a Dell server when compared with our Dell server PCF results. The PCF datasheet provides the carbon footprint of Dell products, which is generated using PAIA, a streamlined LCA tool. (To view Dell PCF datasheets, click here).

The PCF results are calculated on the products highest selling server configuration (low – mid end configuration) while the server configuration analyzed in this LCA represents that of a high-end configuration. The high impact of the manufacturing stage within the Dell R740 LCA exemplifies that the configuration of a server can have a high impact on the environmental results within its lifetime.

Access the full LCA here.

## How will Dell use the LCA Results?

The results obtained from the Dell R740 LCA will be used to:

- Support EPEAT standard regulations;
- Determine environmental hotspots over the product's life cycle which can be used to support the development of environmentally sustainable products;
- Provide answers to customer enquiries

## Did you know?

**1 of these products…**
has a footprint approx. equivalent to **driving 21,112 miles** in a passenger car

**10 of these products…**
have a footprint approx. equal to what **101 acres of US forests** can absorb in a year.

**100 of these products…**
have a footprint about the same as the annual average carbon footprint of **172 people.**

## Further Information

Full LCA

Zendesk

Progress Made Real – Our Vision for 2030

PAIA

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Calculations are based on the following methodologies: 2.45 miles driven per 1 kg co2e (source: U.S. EPA); approx. 850 kg co2e absorbed per acre of forests over a year (source: U.S. EPA); global personal carbon footprint estimated at 5 MTco2e per person (source: World Bank).

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