R STRATEGIES EXERCISE

The following exercise looks into the operational value of the R strategies. How can the R strategies help you make more circular decisions? The exercise is divided in three parts: one for each of the three stages of Smarter Use and Manufacturing; Extended Life-Span and End-of-Life Application (Figure 1). A series of questions will help you better understand how the R strategies relate to these three stages exactly. Use your façade case study as a reference and try to answer these questions and you will soon realize the multiple ways the Rs can affect your material and design decisions.

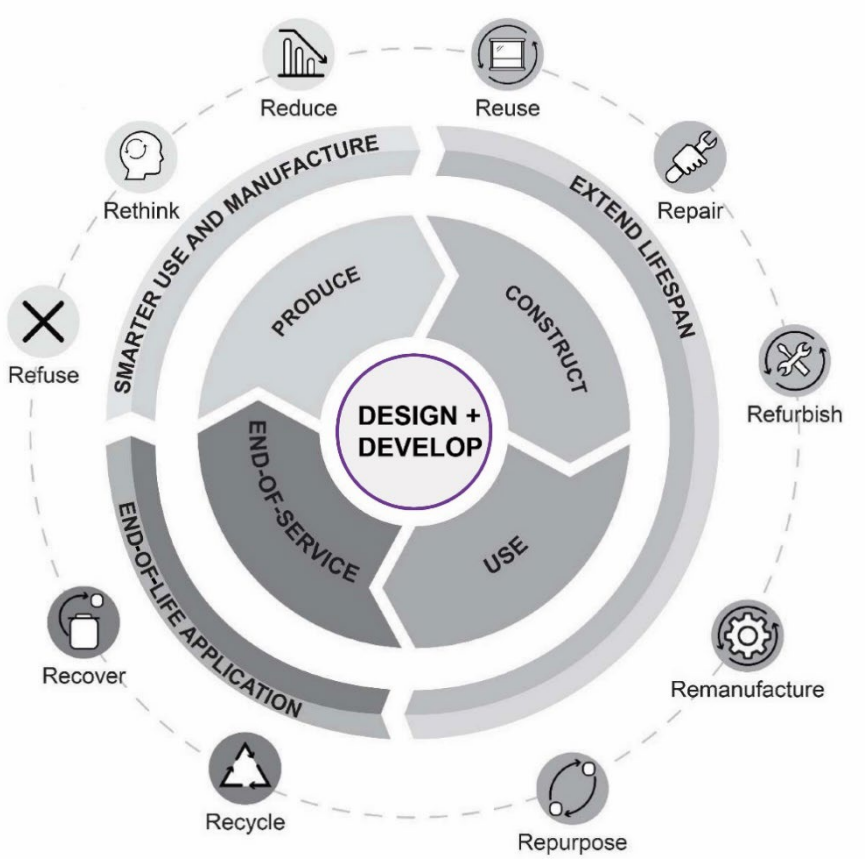

Figure 1: *Distribution of R strategies amongst the three stages of Smarter Use and Manufacture; Extended Lifespan and End-of-Life Application.*

Part 1: Smarter Use and Manufacture

Refuse: Make a product redundant by abandoning its function

1. Do you need all products and materials of the façade to fulfil its functionality?
2. Can you leave any parts away without compromising the function, or durability of the design?

Refusing use of resources is the first and most efficient circular strategy because it prevents the needs to harvest and process materials and the creating of waste.

Rethink: Make product use more intensive

1. What is the expected service life of your façade and its components? Is it designed appropriately and according to its proposed service life?

2. Can you change the architecture of your façade elements and parts to make it more flexible for other future uses?
3. Can you lease or share your façade parts and components?

Rethink addresses the way materials, parts and components are used. A façade for a 10-year use should not be constructed with the same resource effort than a façade the is meant to last many decades. Sharing a car or tools with your neighbours can make a lot of sense if you only need them occasionally.

Reduce: Increase efficiency in product manufacture or use by consuming fewer natural resources and materials

1. Can you replace your façade's technical materials by using alternative products of lesser environmental impact or biological materials?
2. Can you reduce emissions of production and transport efforts?

Reduce concerns not only material resources but also energy and water use as well as GHG emissions. In regard to materials specifically, reduce encourages limiting material use. However, energy-wise the exact opposite might also be true. Think for example about insulation; increasing insulation material ultimately reduces emissions during use. Replacing technical with biological materials is also an option, but you need to be careful: the functionality of a façade should not be compromised and fire protection, degradation by weather must always be considered.

Part 2: Extended Lifespan

Reuse: Reuse by another consumer of discarded product which is still in good condition and fulfils its original function

1. Can any of your façade components be reused elsewhere without requiring fundamental changes? Can you think of any potential reuse scenarios for the parts of your façade? (by whom, for what, when)
2. What information do you think needs to be provided to potential users to be able to opt for your façade components?
3. How do you think the possibility to reuse façade components affects their dimensions, their surface qualities and their appeal?

Reuse is a simple and effective circular strategy. Ideally it can be done with minor change. In the past we have not paid much attention to it. Reuse today happens mostly for materials that can be reprocessed easily (such as wood) or for components with a high value (historic sinks, faucets or doors, etc.). Reuse as well as the rest R strategies of this part, asks for a new design and construction approach (e.g. design for disassembly). Bricks, for example, cannot be reused because separating them for mortar is too expensive in relation to the value of a single brick. Roof tiles are not often reused although they can be easily taken from the roof. They easily break when stacked and their value is relatively low.

Repair: Repair and maintenance of defective product so it can be used with its original function

1. What kind maintenance and repair will be necessary and can be provided for the different elements of your façade?

2. Can the maintenance be done without compromising other parts of the construction? Can that be done efficiently at lowest costs?
3. Can materials and components of your façade that have a short service-life be extracted and repaired easily if necessary?

Designing for repair is an important activity, meaning to anticipate all future service cycles, activities and costs associate with maintaining the products functionality. It is important that it can be done without affecting adjacent components in a negative way.

Refurbish: Restore an old product and bring it up to date

1. Do all your façade components meet existing and potential future regulations in terms of comfort, energy performance and safety?
2. What are the potential future upgrades needed (energy/comfort/room/building function/design) and can they be anticipated/accommodated by the current façade construction?
3. Can your façade materials and components get upgraded in future refurbishment cycles?

Refurbishment is a more invasive approach than repair. It includes the upgrade to latest standards to allow a future lifecycle. For example, façade refurbishment includes energy and comfort updates or for new safety regulations such as fire protection, escape routes, fall prevention through glass…

Remanufacture: Use parts of a discarded product in a new one with the same function

1. Can any of your façade components be remanufactured and used again with the same function? Can you identify which?
2. Can the parts needed for remanufacturing be extracted without damaging the façade?

Remanufacturing can include processing steps such as collection, cleaning, repairing, upgrading, surface treatment, quality checks and redistribution to production facilities. etc. Remanufacturing for facades can also mean to adapt dimensions of used parts of by cutting or milling so they meet new requirements in terms of size and grid of buildings.

Repurpose: Use discarded product or its parts in a new product with a different function

1. Can parts of your façade potentially have a second life in a different function?
2. Can they be easily extracted?

Repurposing needs a 2nd hand market strategy if the new use is not anticipated at the beginning. A problem is the information about included materials, health and safety, producer, warranties, maintenance quality, etc. that needs to be associated with the product of its whole lifecycle. Also, the potential residual value is important. Anticipating a new future use and functionality is not easy.

Part 3: End of Life Application

Recycle: Process materials to obtain the same (high grade) or lower (low grade) quality

1. Can the materials of your façade get recycled to the same or higher quality of the original resource?
2. Can biological materials be used as feedstock? Can they get recycled?

Recycling is a complicated matter. Aluminium, for example, comes in many different alloys, giving it targeted qualities. Thus, feeding old aluminium window frames to scrap aluminium stocks, destroys its original quality and results in down cycling. It cannot be used again for extruding window frames without extensive processing.

Recover: Incineration of material with energy recovery

Recovering is not a circular strategy. It leads to the destruction of ecological and economical value of materials.