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Digital Site Logistics

How to make your site logistics fit for the future
by introducing a digital gate-to-gate system

Introduction

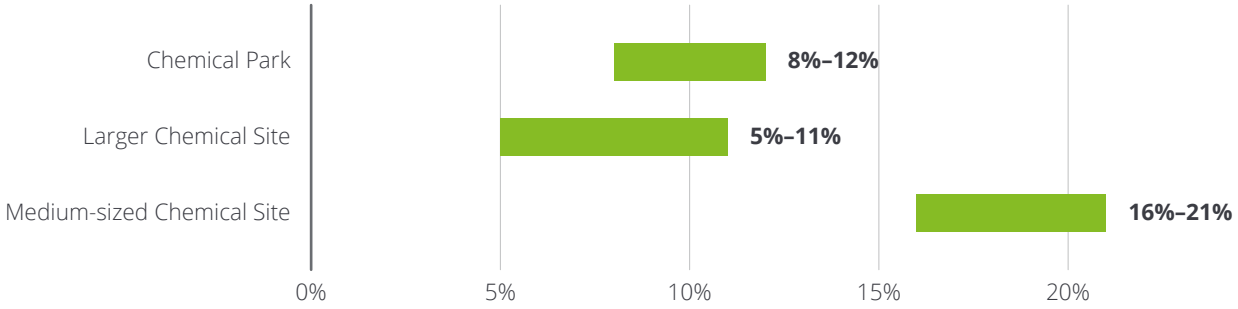
Site logistics are an essential part of a company's supply chain and cause bottlenecks in the overall value chain if not executed properly

Site logistics per se contribute little value. This is why the focus is on safety, efficiency, speed, and low cost rather than on a great user experience or specific customizations. However, site logistics can cause bottlenecks in an otherwise well-functioning supply chain.

If the inbound is not working reliably, just-in-time processes are not possible due to the risk of delays. A significant amount of additional storage space is required as a precaution, which results in inefficiencies. If the trucks do not leave the site as planned, delivery windows at customers may be missed and deliveries delayed or products with temperature restrictions spoiled due to a longer time spent inside a truck.

A dependable site logistics process is therefore a prerequisite for optimizing the supply chain as a whole – it is a basic enabler. We recommend setting up a well-planned digitalized gate-to-gate process to exploit all of the opportunities provided by digitalization. It is important that the use cases chosen be sustainable, scalable, and have a positive impact on overall operations.

Fig. 1 – Project Example: Benefits in Site Logistics Operations Cost*



Ranges indicate most frequent values. These strongly depend on current maturity level of site logistics operation and in particular for smaller sites on site-specific parameters.

* Larger Chemical Sites are of smaller scale and less integrated than chemical parks but usually cover different businesses. Medium-sized Chemicals Sites are typically a bit smaller and often dedicated to a single business.

Fig. 2 – We experience five main challenges at our clients regarding site logistics

Digitalizing site logistics helps to improve all of the five points mentioned above. It also makes processes more reliable and efficient and enhances safety. "Digitalization" can involve different activities depending on the current and desired level of digitalization maturity on the company premises. The decoupling points are a good place to start.

In the following pages, we will follow a truck – the most common form of transportation to and from sites – through its typical journey at a company site. Based on this example we show typical challenges and opportunities for improvement through digitalization.

To make the explanations more tangible, the affected areas are shown at each deep dive. They are clustered as follows: safety, cost, time, flexibility, and stability.

"An external service provider looks after my site logistics. However, I do not have a good overview of what is happening at my plant!"

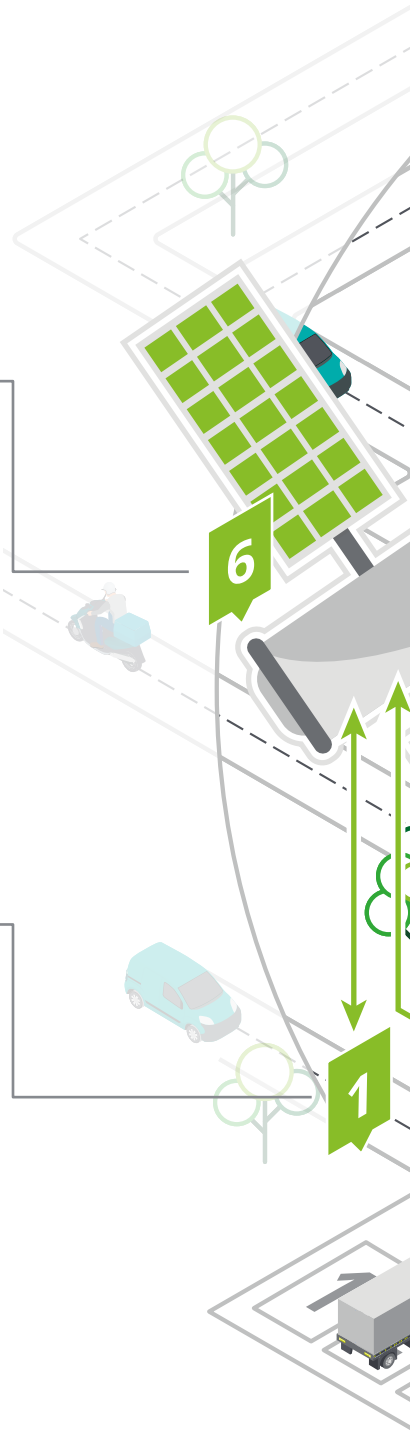
European Site Manager

"The truck for one of our most important premium customers was at the very back of a long line at the Filling Station. It was unable to be loaded that same day and was delayed leaving – while non-urgent trucks were filled. As a result, we lost the order and our client lost some of its trust in us!"

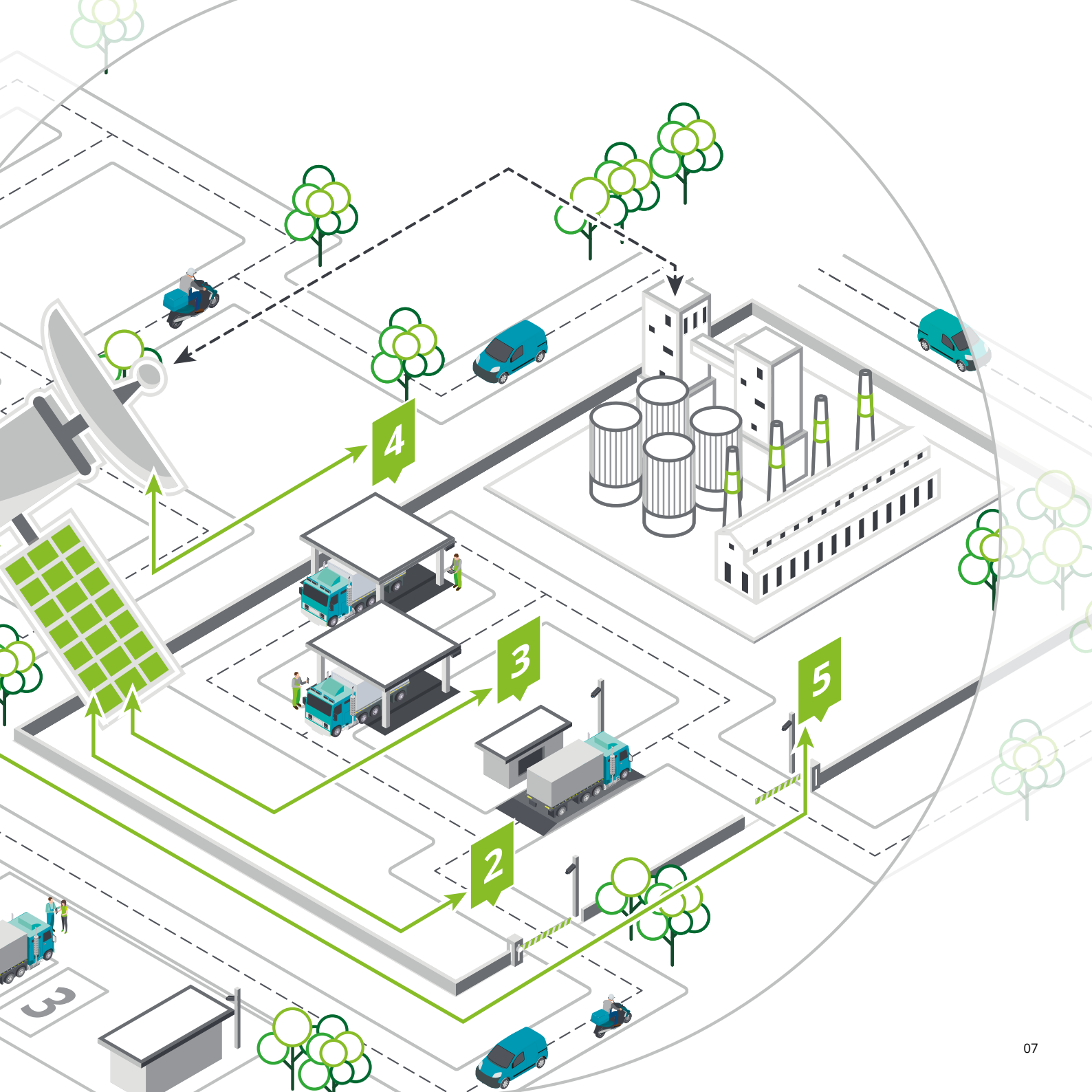
Business Unit Head, Chemical company

"Some truck drivers were unable to find the correct Filling Station in time due to a lack of or misleading signage, which caused a delay in the process."

Supply Chain Head, Chemical Company



1 – Decoupling Point
2 – Gate Entry
3 – Weigh Station
4 – Fill Station
5 – Gate Exit
6 – Data sharing platform


4
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2

Decoupling Point

The decoupling point is an area outside the gates that is available around the clock for logistics service providers. It is designed to ensure that trucks enter the site on time, reducing unnecessary traffic and preventing crowded loading areas.

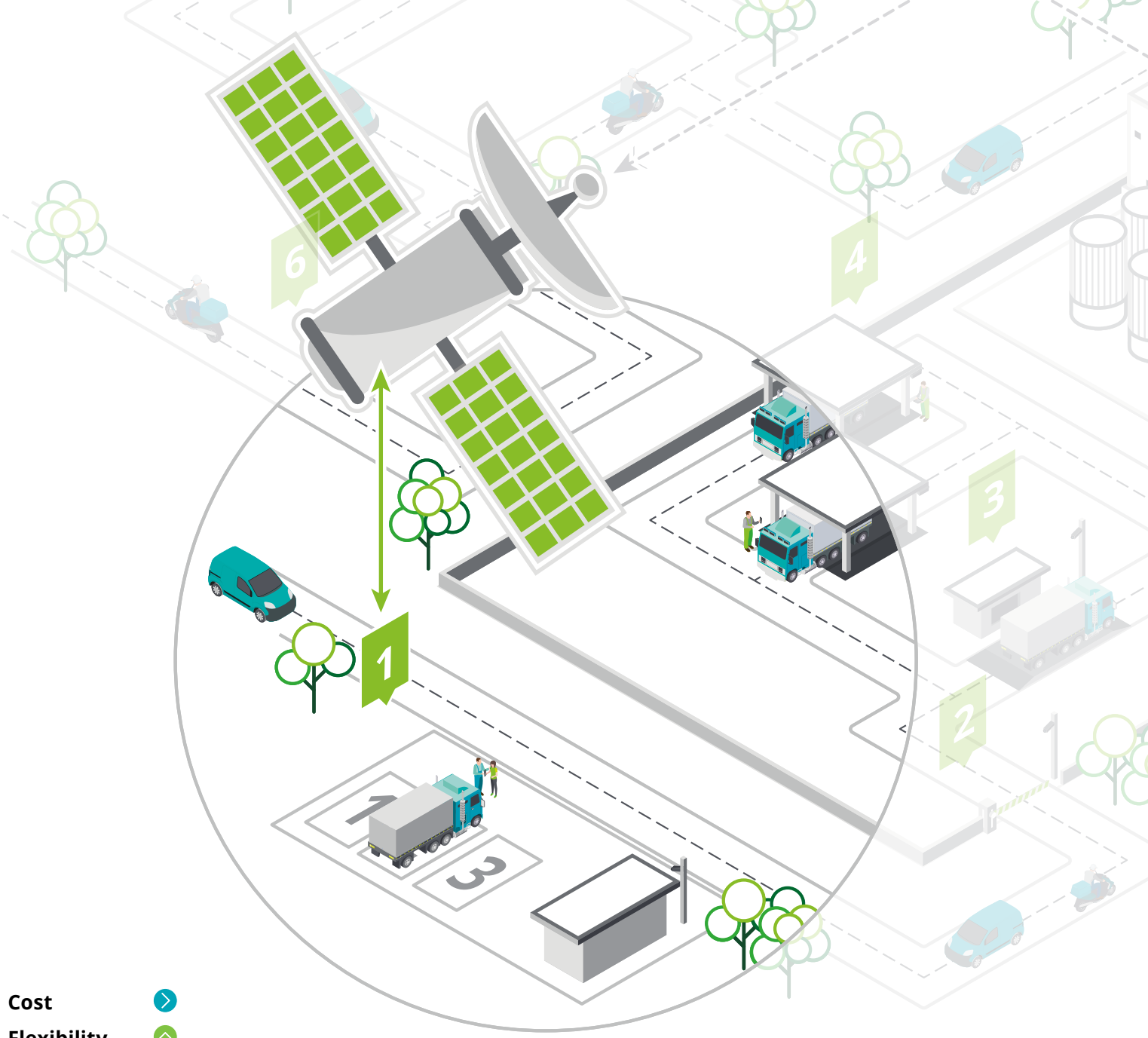
Today, many decoupling points are still coordinated mostly via paper. As a result,

- employees on site lack on-time information
- truck call-offs are not well structured
- drivers experience long waiting times and
- there is heavy traffic on site

A digitalized decoupling point changes the overall on-site process, facilitating real-time transparency and accordingly organized processes.

- Every transport provider/truck driver has to register and make sure to have a valid pre-announcement before arriving at the decoupling point
- Upon arrival, the trailer is dropped off at the decoupling point, where a parking management system provides transparency about the drop-off location of each truck/container
- The truck is automatically checked into the data sharing platform, where all necessary information on administrative checks such as cleaning, certificates, etc. is available. This helps to finalize all checks regarding safety as well as equipment for loading and unloading upfront
- The equipment is called off from the decoupling point when the product is available and the Filling Station has confirmed the loading slot

- There is real-time visibility of all trucks at the decoupling point, including status and delivery details
- Trucks are asked to enter the site at the right time, significantly reducing traffic on site while enhancing flexibility as truck slots can be changed easily based on information from the stations
- It is ensured by the system that only trucks that conducted the necessary checks are called to enter the site



Cost

Flexibility

Safety

Stability

Time

Gate Entry

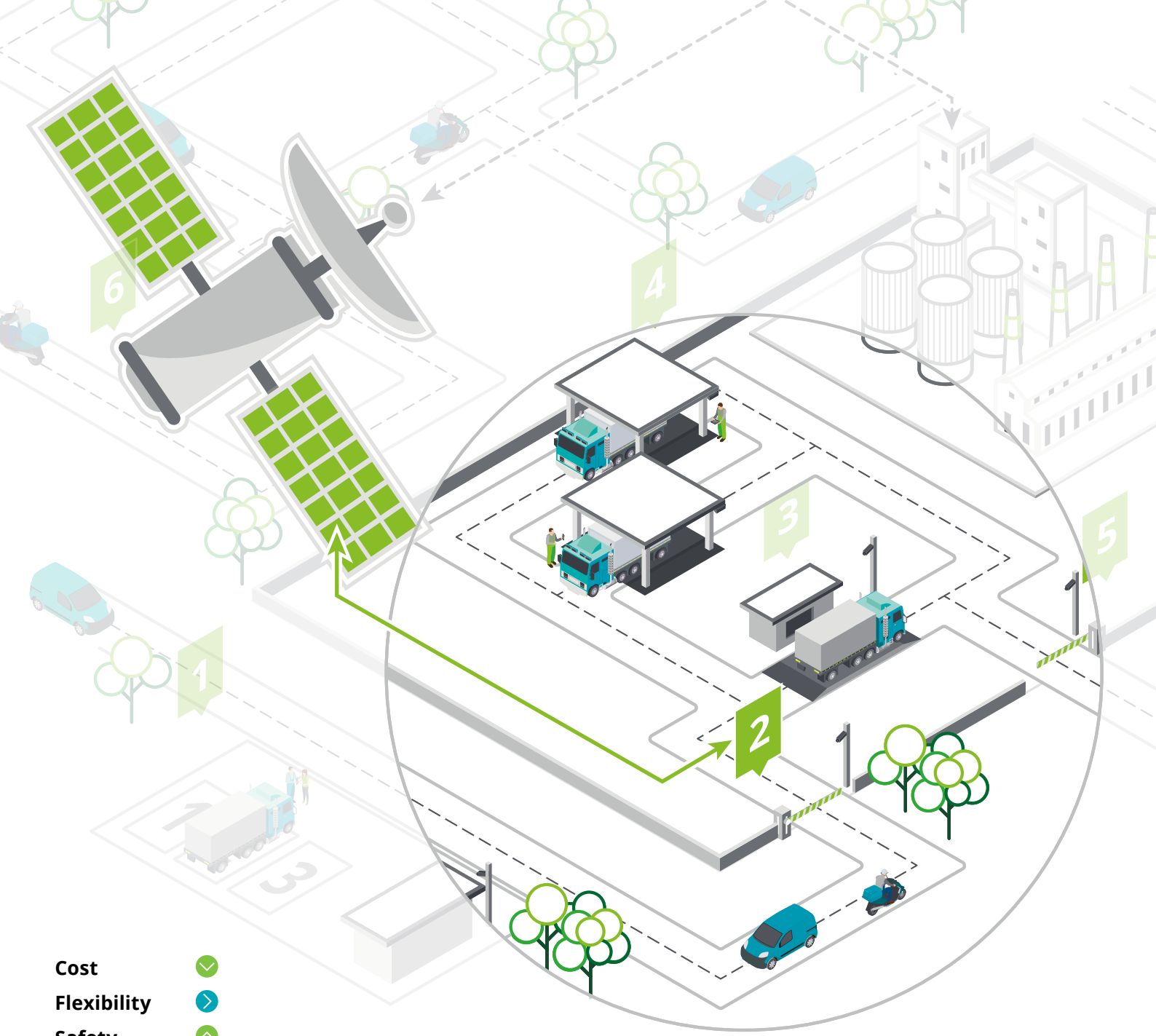
In the past 30 years, the quantity of goods transported via truck has increased dramatically. This has led to a significantly higher number of trucks needing to enter and exit sites. However, we see at many clients that the entry technologies and procedures have not been updated accordingly.

As the gate entry is the point that every truck has to pass, it can easily become a bottleneck if the entry process is unable to be executed with the required speed. On the one hand, controls are required to ensure that, for example, only trucks for which the required safety checks have been performed can pass, which takes time and results in delays. On the other hand, urgently needed goods or raw materials cannot reach their destination on time if the truck has to wait in a queue outside the site.

A digital gate entry is a facilitator for efficient subsequent processes, ensuring stations are prepared when the truck arrives.

- Due to the decoupling point, the truck arrives at the right time at a fully automated gate. The identity of both the equipment and the driver are verified
- QR code or optical character readers can work as "keys" for gate entry and link to container numbers, weight, and maximum truck load and pre-send this to the weighbridge and Filling Station as upfront information
- A tailored app available to all truck drivers includes a navigation system that helps on-site navigation to reduce traffic jams and delays on site
- Weighbridge and Filling Station are alerted about the arrival, and the system is updated to “gate entry successful” and therefore transparent to the truck driver and the workers on site

- Quick access to the site as all required information is stored digitally and kept up to date
- Safety is increased as only validated trucks can enter and human error is eliminated in this point
- The real-time information of truck entries gives an overview of trucks on site and allows subsequent processes to be prepared for a more efficient throughput time



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Weigh Station

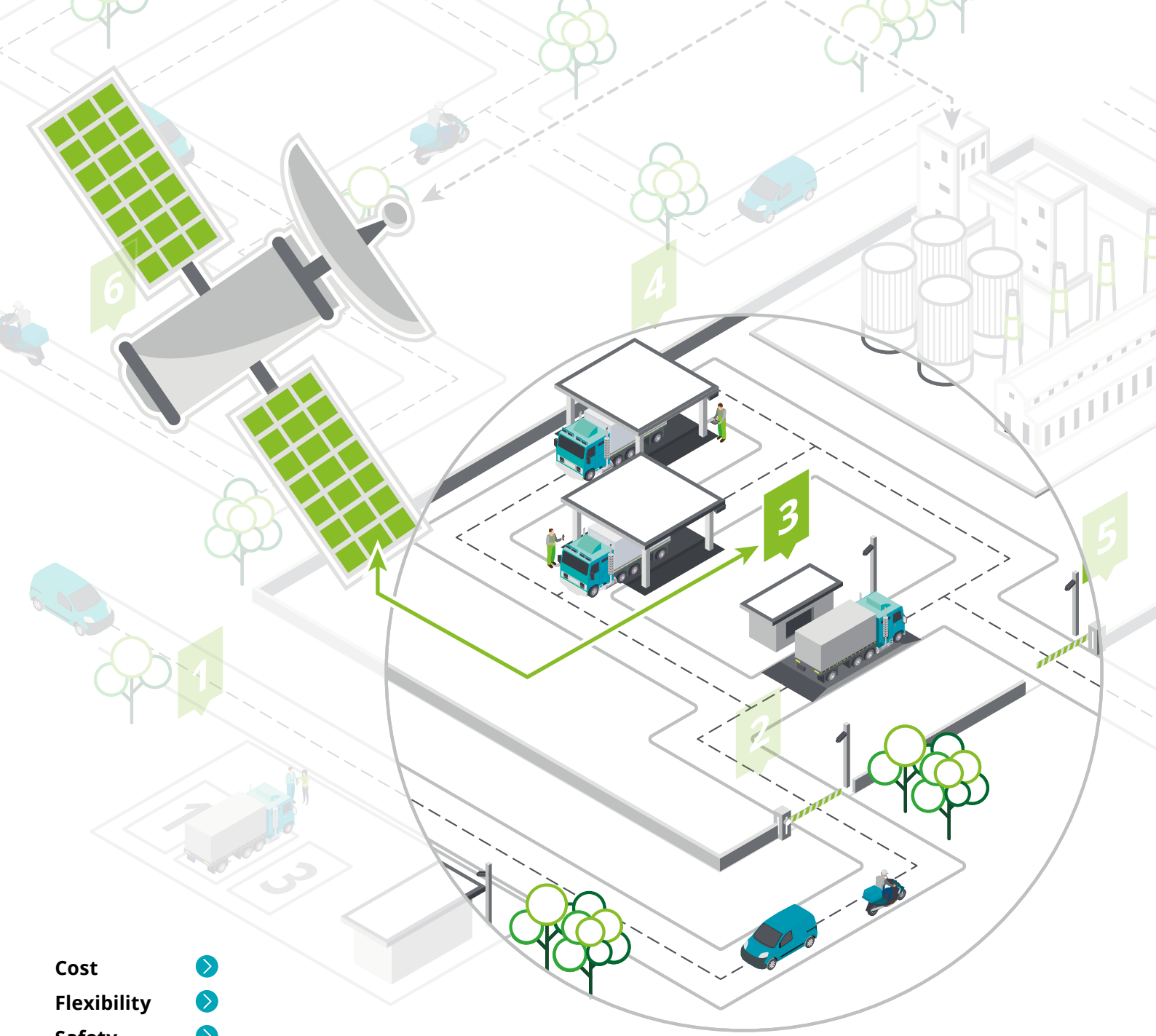
The weigh station ensures that trucks are filled with the predefined quantity of goods by weighing the empty and filled truck before and after the Filling Station. It is an important safety measure, so the focus is on a reliable and quick process.

Today, many weigh stations are still run manually and some have to be operated by the truck drivers themselves. This means the truck weight is written down by hand on a sheet of paper. Language barriers, handwriting, and a mismatch between indicated weight and actual weight lead to significant delays in this supposedly short check. Then, trucks are queued up and subsequent processes get slowed down. This often makes weigh stations a bottle-neck in site operations.

A digital weigh station enables an efficient and safe weighing process, resulting in reduced queues and seamless processes.

- The weighbridge is fully automated. The check-in is performed by optical character reader or a QR code that is linked to all relevant information
- In the event of a mismatch between previously provided information and weigh results, the system issues a notification and the responsible employee is informed
- Once the empty truck is weighed, the truck is released to the Filling Station (inbound)/ exit gate (outbound) and the order status is updated with the weighing results
- The operator at the Filling Station is informed about the arrival of the truck so the station can be prepared in advance for a seamless process

- Manual handling and errors are eliminated
- Reduced queues through a significantly faster process with fewer disturbances and defined procedures in the event of mismatches
- Truck data is automatically matched with expected input from the gate entry or filling station



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Filling Station

At the Filling Station, the truck receives its correct load in the planned quantity.

Many stations are still managed by an operator, who receives a clipboard with the information on the vehicle, order, and product. Human error is therefore likely (even based on illegible handwriting), and processes may take longer than necessary. Consequently, trucks often have an unnecessarily long wait. Trucks may even arrive at the station in the wrong order due to disorientation on site, slowing the whole process down and delaying production.

A digital Filling Station is essential to get from paper clipboards to a safe, digitally integrated process with real-time transparency.

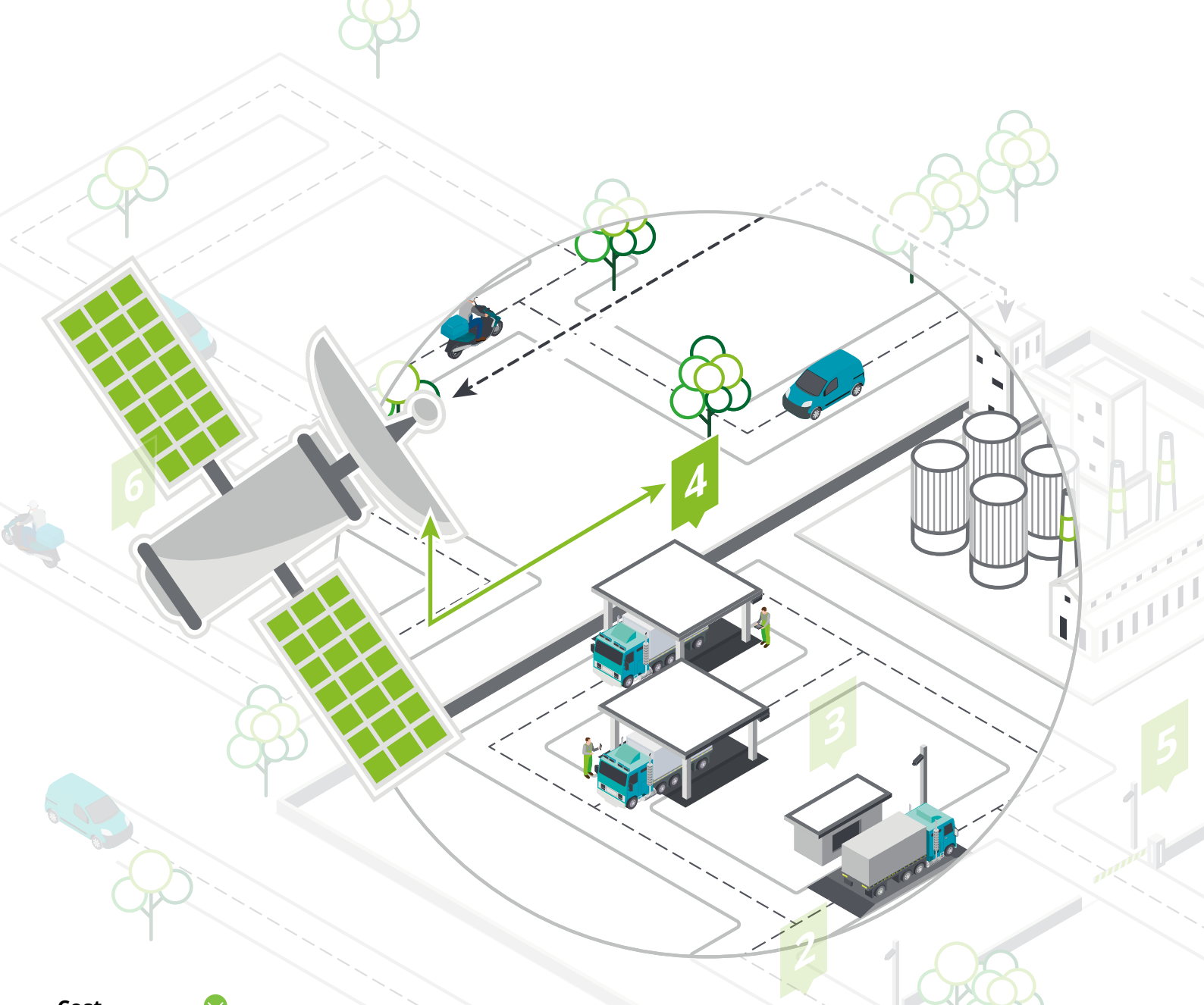
The operator is informed in advance of trucks' imminent arrival and can still control their sequence based on current requirements.

- The operator has full digital (e.g., by tablet) transparency about the vehicle, customer, order, and product by scanning a QR code or through optical character reader
- The operator checks all available information and, if necessary, conducts additional checks. The operator is guided through this process via interactive electronic checklists to prevent mistakes
  - If the truck is rejected, all parties involved will be informed immediately and automatically to ensure that appropriate steps are taken

- All information about the truck including loading volume, weight, etc. is called off through a system. Once filling is completed, the system is updated with the actual fill volume
- The order is then updated in the system to "loading completed" and the driver as well as subsequent stations are informed

- Through the gate entry and weighing station, trucks are controlled in the right sequence
- The electronic guidance ensures that all necessary steps are taken and all information is correct

- Real-time transparency about truck status



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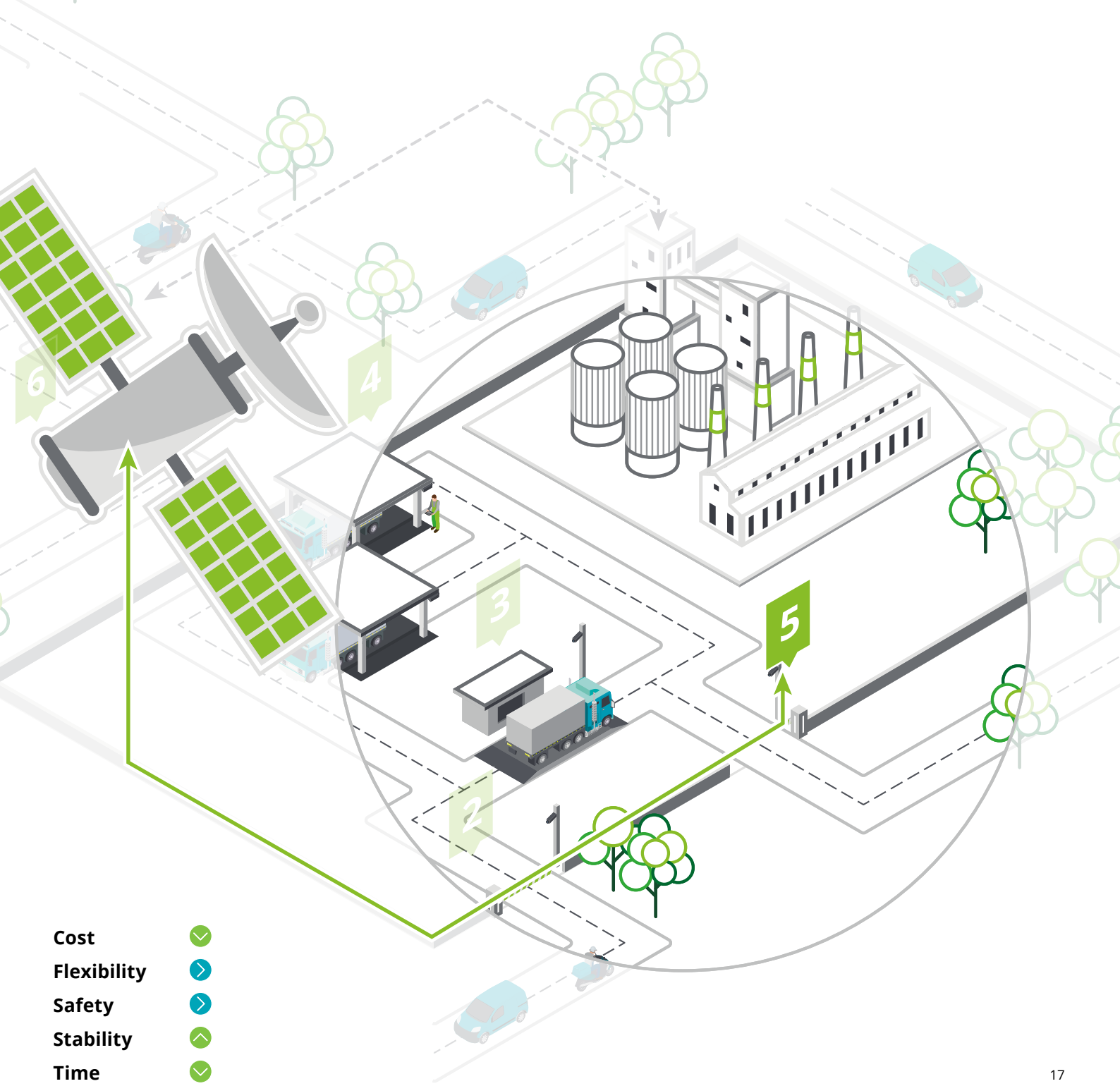
Gate Exit

Before a fully loaded truck can leave the site, it needs to be clarified whether specific additional shipping documents are required, e.g. due to an intermodal transportation. Often there are long wait times, as specific shipping documents are required that need to be requested, printed, and handed out. The requests are often handed in at the last minute before leaving the premises, meaning trucks have to wait before exiting. This leads to more trucks than necessary on site, requiring additional safety space.

A digital gate exit enables expeditious departure from the site while ensuring that all relevant information is provided digitally.

- Based on the information that was previously provided in digital form, shipping documents are printed automatically and provided to the driver at gate out after the truck QR code has been scanned. Depending on the site, the documents can be prepared after the truck left the weigh-out station
- In the case of LSP arrangements, the truck makes its way to the decoupling point for collection. If there is any non-conformity mentioned by the system, the truck is put "on hold" until all checks and verifications have been completed
- The order is updated in the system and thus transparent to the driver, LSP, and employees on site

- Automated processes with little human interaction required
- Prevention of queues at the exit area
- Significantly reduced idle times for truck drivers



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Data Sharing Platform

The data sharing platform is connected to all relevant areas, receiving and transmitting data in real time. It is essential to first define the required data and ensure correct measurement, as only relevant and accurate data produce the desired results.

The data sharing platform is the core of each digitalized site as all input and output for all operations on site is processed here.

The data sharing platform acts as a control tower with the following three focus points:

1. Further integration of on-site logistics into daily operations

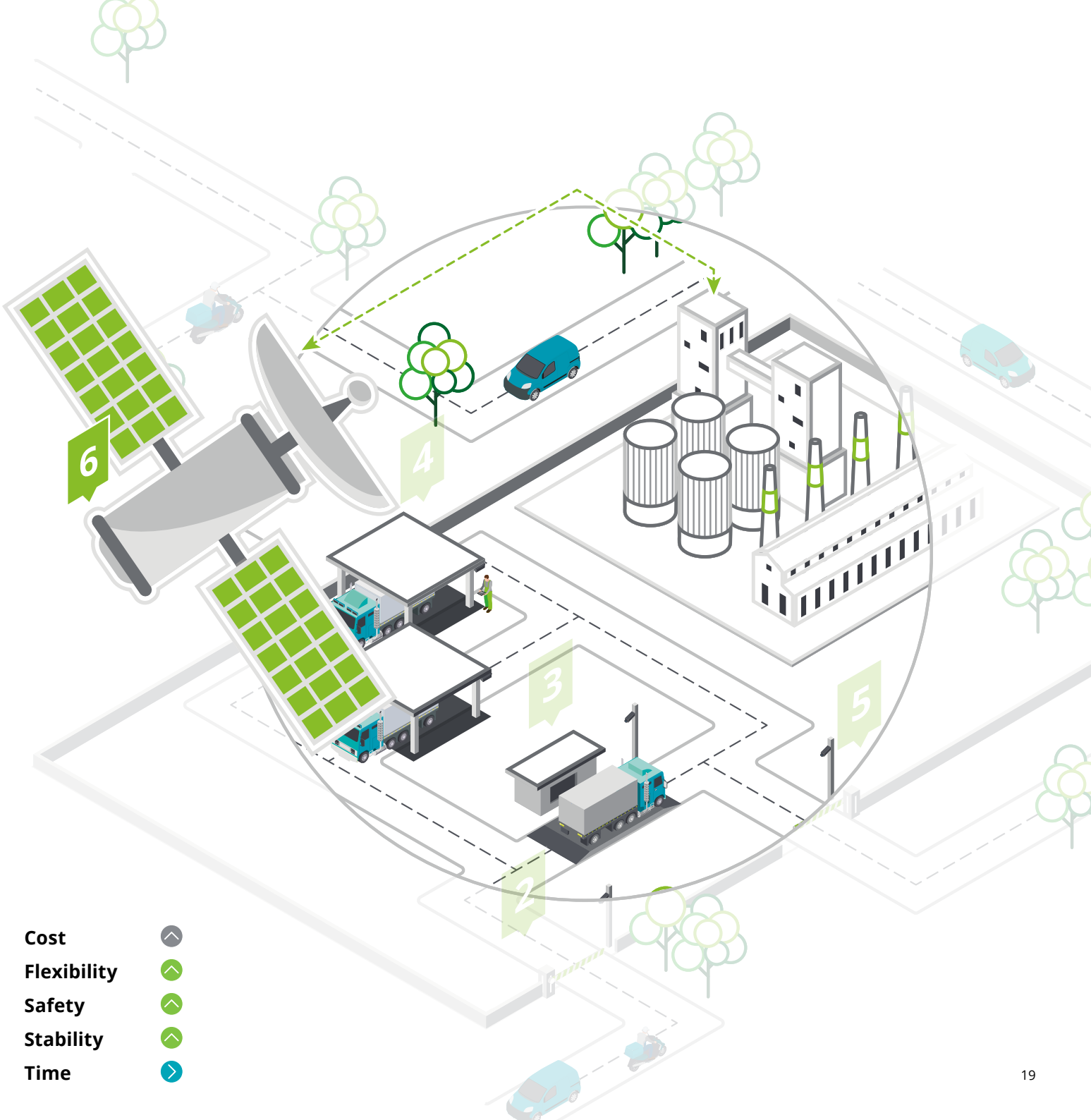
- (Near) real-time identification of delays and disruptions in the process
- Pro-active communication to the customer regarding the order status
- Alert system to take action early on in the event of potential disruptions

2. Agile business environment on site

- Quick matching of capacity demand and supply (e.g., equipment, labor)
- Real-time sequencing of Shipments according to priority and service level risk
- Seamless synchronization of material flow and information flow in real time

3. Enablement of data evaluation

- The recorded data should be used not only for daily operations, but also for tactical and strategic planning
- Data analyses allow identification of potential for improvement and process enhancements
- Site restructuring and updates can be planned based on hard facts and evaluations



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Data Sharing Platform – management and operator view

To make full use of the possibilities of digital site logistics, the data output has to be set up based on the recipient's requirements. Too much/irrelevant information or poor visualization results in low acceptance of the new technology. Before implementing the new system, it is helpful to study processes and consult employees regarding beneficial information and the type of display (e.g. smart glass versus tablets).

A well-defined data sharing platform includes the following benefits for users:

- All transmitted information is customized to the requirements of the process role and visualized digitally (for example via tablet, monitor or smart glass, depending on function and needs)

- The transparency about the actual situation in the process makes sure that everyone involved
  - has the relevant information for their role
  - can see their impact on the overall process chain
  - is supported in decision-making in order to achieve the right safety level, service level, and service cost

- The platform managers have a real-time overview of all trucks on site including detailed information such as status, products, and further details

Conclusion

Digitalizing your company's on-site logistics provides a multitude of opportunities and benefits—both quantitative and qualitative. Processes are more reliable and safer, but also more flexible because they can be adjusted based on real-time data. Costs are lower due to faster processes on site and standardized, less manual procedures.

The right planning and setup are essential for helpful and beneficial digital logistics, so consider the following questions when designing your future structure:

Organization and setup

1. **Internal**
   Can my current organizational setup cope with a digitalized site? How can the challenges of a digital journey be tackled? Do I want to build up more knowledge internally or draw on external support? ...

2. **External**
   Would my logistics partners, e.g., carriers, be interested in becoming more digitalized? Does the contract setup support such a change? In the case of chemical sites: Do I want to integrate further site users into my change process? ...

Data

1. **Data input**
   Which relevant data do I need and can it be captured with reasonable effort? How can I ensure easier, automated processes instead of additionally required manual input? How can I integrate these data capture points into the on-site processes? ...

2. **Data processing**
   Which type of technology and setup is best for my site? How can I integrate this into existing isolated solutions? Do I want to build up my own specialist team and internal knowledge or do I need external support for setting up a data sharing platform? ...

3. **Data output**
   How can I ensure usage of the new possibilities for all users? What is the data that should be shown in the dashboard for a site overview? Does it make sense to adapt current procedures to match digital possibilities instead of depicting old processes with modern technology? ...

Processes

1. **Standardization**
   How standardized are my current processes on site? To what degree can these processes be standardized and how much effort would this require? Can my desired solution be adapted to other sites? How can we ensure that activities that do not fit into the standard processes are covered within the digitalization and do not require substantial manual effort? ...

2. **Acceptance**
   What actions are required to ensure that the new processes are used both internally and externally? How can we show the advantages for everyone involved? How do we ensure data protection for ourselves and our clients? ...

Next steps

1. **Identify your current state**
   Set up an assessment with checklists and get an overview of the as-is situation. Compare different sites to get a feeling for the maturity levels and rankings within your company. Based on pre-defined categories and scoring systems, develop a full picture of the current situation.

2. **Set a realistic target**
   Think about digital possibilities in general and then match them to your company's requirements and options. Sure, full automation sounds great, but does not make sense in all cases. Identify your aspired maturity state both for the medium-term and long-term horizon.

3. **Develop a roadmap**
   Based on the target picture and as-is situation, identify the biggest gaps and opportunities. Match digital opportunities to your reality, especially as regards data quality and master data. Prioritize the measures based on impact and effort, set up an implementation plan, and start soon instead of waiting for the perfect concept.

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