Ropeways

Ropeways are a type of transportation with cabins, buckets, or open chairs suspended above the ground from one or more cables (ropes), usually supported by a series of towers and moved using a motor at one end. If that definition feels a little generic, it's because there's a ton of variations we're about to get into!

Types of Ropeway:

One of the first big distinctions is whether the system has multiple small cabins hanging from a moving cable, or a single bigger car moving along a fixed cable. The naming system is all over the place on these but these general categories should help.

- Aerial tramways or cable cars generally have one large car suspended from one or two stationary cables (track cables) for support while a separate moving cable provides propulsion. An electric motor at one end of the route drives the haulage rope which provides propulsion. Some systems have two cars on separate track cables connected by their haulage rope, so they can use the weight of the descending car to help lift the ascending one. This is more popular with steeper runs.
    - Advantages: A single cabin can transport up to 200 people. They seem to be good for crossing a longer single span and may not need any support towers. Generally a little more stable making for a more comfortable ride.
    - Disadvantages: Aerial tramways usually provide lower line capacities and longer wait times than gondola lifts.
- Gondola Lift: These ropeways have multiple small cabins attached to a continuously circulating, moving cable that is strung between two or more stations, over intermediate supporting towers. The gondola cabins often have detachable grips, enabling them to slow down in the stations to make boarding easier/safer. It is often considered a continuous system since it features a haul rope which continuously moves and circulates around two terminal stations. In contrast, an aerial tramway operates solely with fixed grips and simply shuttles back and forth between two end terminals.
    - Advantages: continuous operation, you always know when the next car is arriving. Shorter wait times. Gondola lifts can have intermediate stops.
    - Disadvantages: lower capacity per car, less comfortable ride (though some gondola lifts also use track cables for stability).

There are tons of variations on these two broad categories though! Some gondola lifts also use track cables/support ropes (these are sometimes known as bi- or -tricable lifts). Some Aerial Tramways propel themselves with their own onboard power (such as a gasoline engine) rather than use an external large electric motor at the end of the run. Some ropeways use a sort of hybrid design with multiple large cabins suspended on track cables but operating in a continuous loop like a gondola. And some of the longest ropeways ever operated hauled freight instead of people. If you want to really dive into all the variations of these systems, the wikipedia article on aerial lifts is far more detailed than I'm willing to go. The important thing is that there's an absolute ton of options and examples to draw from.

Why Ropeways

Ropeways have been used for both passenger service and freight for decades, and can make a lot of sense in the right context. Many cities use them as part of their public transit network. The general belief is that these make the most sense when trying to add additional public transit to dense cities with steep terrain, such as the Metrocable in Medellín, Colombia or the Cablebús in some parts of Mexico city, but many cities use them over relatively open, level ground.

Their main advantages are:

- Ropeways are a separate layer of the public transit system - similar to trains and subways, they don't operate on the streets so they both free up congestion and can't can't get delayed by traffic. This means that they stick to their schedule better (plus you can always see the next car coming). Reliability is huge in getting people to trust public transit.
- They're much cheaper and lower-impact to install compared to a train or tram. Standing up some support towers and running cable over neighborhoods is much easier in terms of approvals and buy-in than bulldozing a swath through them, it's much faster and cheaper than digging tunnels underground. This means a city can stand up a new public transit option/layer comparatively quickly, and that it's generally more achievable.
- Ropeways can cross rough terrain (trains need special mechanisms to climb steep grades and there are safety concerns for busses too). If the city is built on a mountainside, or crisscrossed by rivers, the ropeway operates more or less the same regardless of what's below it. The cost to install the system is also similar when crossing rivers as when crossing land.
- Because the propulsion system is external, set up at one of the terminals, it can be powered directly off the grid, so it is easier to adapt to green energy and doesn't need small, dense, high-tech batteries like you'd use onboard an electric vehicle.

Disadvantages:

- Considerably lower throughput than many less exciting alternatives. When it comes to the number of people moved, trains are basically impossible to beat.
- Maintenance can be a considerable requirement for these systems, and failures can be quite serious.
- They are sometimes considered more of a tourist benefit rather than a practical aspect of a public transit network.

Ropeways in rural areas

Ropeways already operate in rural areas around the world, usually providing access to communities which would otherwise be isolated by rough terrain. In a more solarpunk future, where an extensive network of public transit options interconnects even small villages, ropeways could make sense in situations where extending a full train line to service a community is too costly, or where terrain or the degradation of existing roads makes bus service impractical. Ropeways can climb mountains and cross rivers, lakes, wetlands, and even forests (in some configurations, they may still need access trails for maintenance and rescue) with a minimal impact on the underlying habitats. They also move very quietly as the drive is at one end of the line, and is likely running on an electric motor.