# ELECTRIC COOL


Photographs by Matt Maynard

Formula E electric car racing is now a serious player on the international motorsport calendar. From the heat of the Santiago street race, **Matt Maynard** investigates whether the championship is a sustainable showcase for combatting air pollution and climate change, or just a less noisy distraction from more serious issues...

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Santiago's racetrack caused controversy, with local residents complaining about congestion

Combustion engines have been banished overnight. The skyscraper lined streets are empty. The soup of everyday smog is clearing as the sun rises over the Andes. Into the new dawn, early-rising spectators pace down the middle of Santiago's triple-lane streets. They run the redundant red traffic lights with abandon.

The centre of this inner-city is not usually a car-free space. Far from it. But this weekend the FIA Formula E championship is in town. Inside a ring of fencing, colonial grid streets have been re-shaped into chicaned raceways for 225km/h supercars. Now approaching its fifth season, the series boasts that it is 'fighting climate change by offering electric vehicles as a solution to air pollution in city centres.' Formula E argues that the street level spectacle is 'breaking down the barriers to the electric vehicle market.' Yet behind each of the ten teams and 20 drivers are hundreds of employees who jet in for each of the series' 12 races in different cities around the world. With such a high carbon footprint before they even touchdown, the FIA, the governing body of global motor sport, needs to pull out all the stops in advocating the environmental spin-offs of Formula One's 'greener' cousin.

## 21ST CENTURY SPORT

Eager spectators are moving towards the free-access 'E-Village' exhibition area at track side. Inside, motorsport enthusiasts are playing driving videogames, cooing over snazzy electric vehicles (EVs) and queuing for a selfie with a supercar. Even the EV charging stations draw interest, where fans strike cheesy 007 action poses with the nozzles. It's a young crowd, with one of Formula E's unique attractions being the 'Fanboost' feature enabling spectators to vote on which three drivers receive a computer-game style 17 per cent power increase for five seconds during the race finale.

Personality is everything here. For example, the Venturi team is founded by actor-cum-climate-activist Leonardo DiCaprio, while Prost, Villeneuve, Heidfeld, Massa, Rosberg and Coulthard are some of the familiar Formula One names with an involvement in electric racing. And with racing on five different continents in the 2017/18 season, Formula E is reaching fans that are young and diverse and for whom electric, it seems, is cool.

Each race heavily promotes the advantages of electric car ownership

It's not all plain sailing though. For weeks the local radio stations in Chile have aired equal parts excitement and complaints from city residents. Motorists were upset about the road closures, claiming the congestion generated would create more air pollution than the cars kept off the road. Throughout the weekend, a nearby housing block bears a banner protesting the ticketed entry to the normally public-access Parque Forestal.

Four days before the race Felipe Alessandri, the Mayor of Santiago, threatened to cancel the event if his office's demands (including a new £545,000 usage fee for the park) were not met. Just three days before the event, Formula E successfully faced down a legal challenge from local residents claiming the event compromised their personal security and liberty. The Chilean Court of Appeals ruled against the residents, stating that 'the goals of the Formula E championship are of profound importance to the promotion and strengthening of sustainable practices.'

On an international level, Formula E has been criticised some motorsports enthusiasts for being slower than Formula One, with fans missing the smell and the noise of petrol engines. But electric racing has hit back, claiming its greener credentials are making the sport relevant to the 21st century.

Despite the green credentials of the race, each team leaves a heavy carbon footprint in transporting its hundreds of staff

In a city such as Santiago – where smog gets so bad that schools are advised against letting children exercise outdoors – any nostalgic argument about the smell of fossil fuel combustion seems not only irrelevant, but irresponsible. Formula E's 2017/18 season included visits to Mexico City and Marrakesh – cities similarly affected by air quality issues. As these particular stops on the circuit and beyond continue to develop, the 'decoupling' of their emissions trajectory from their economic growth rates will be essential to limiting planetary warming. The FIA Smart Cities forum, held before race day in Santiago, showcased the series' intention of promoting safe and sustainable urban transport adoption, and during the race weekend itself, the various petrol-head critics seem to have stayed at home.

As a sound somewhere between a Scalextric set and a *Star Wars* lightsaber emerges from the race track, the excitement is also turning electric. During the ensuing qualifying laps, an electric-blue race car smashes into the crash barriers on the corner of Alameda and Irene Morales. The Renault e.dams driver, Nico Prost, carried too much speed into the turn and his wheels locked up. His hands-on-hips inspection of the destruction reveals not just damage to the front wing but the chassis too. Removing his helmet, Prost begins jogging in his triple-layer Nomex racing suit back towards the pits under the gaze of both mounting spectators peering from balconies and the sweltering South American sun.

## GRID DECARBONISATION

The interaction between local residents and Formula E's city takeover is not entirely harmonious. Shoppers with heavy-looking bags are perplexed that their normal route home has been dissected by a racetrack, leading to an impromptu arrangement for the use of an exclusive overpass built for the event. Thickening crowds voice complaints about the professional photographers blocking their view while the snappers moan about the event security that regulates their access which a British sports photographer describes as 'like nothing I've ever seen.' The meeting of cultures is stark. Clearly Santiaguinos want to be at the forefront of the event in their city. But while I followed Prost to the pit lane, I couldn't help but notice that Spanish is increasingly drowned out by the predominant English accent of motorsport. Indeed, at the very core of the event is a UK-built machine that makes all the racing possible.

'You don't want to be running a diesel generator in the middle of a city,' explains Paul Day of Aquafuel Research about how it charges Formula E cars. The CEO of the Kent-based engineering firm builds and provides training to Formula E on the use of its bespoke combined heat and gas generators. Its machine runs on glycerine and can deliver an identical charge to all 20 Formula E cars simultaneously in 60 minutes. The fuel is a by-product of the manufacture of biodiesel from animal fats or vegetable oils; it's so

**Instead of drawing from the grid or burning diesel in a generator, Formula E propels its supercars using vegetable power**

pure that you can drink it and when combusted creates very low emissions. Formula E and EVs will only ever be as low-carbon as the energy supply powering the cars. The UK produced 24.5 per cent of its grid electricity from renewable energy sources in 2016. Chile reached 17 per cent last year (although this figure is rising rapidly and has tripled since 2014). So instead of drawing from the grid, or burning diesel in a generator, the electric race series propels its supercars using vegetable power.

'Formula E actually believes in this,' says Day, referring to his client's 'ideological' stance on reducing emissions and promoting EV uptake. 'It invested in our technology right from the first race.' The energy sector is responsible for approximately 35 per cent of human-caused global greenhouse gas emissions according to the Intergovernmental Panel on Climate Change, and transport makes up 23 per cent of that figure. Aquafuel technology is not only helping drive down these transport emissions on the racetrack; it's contributing to cleaning up the energy sector as a whole. 'Large buildings very often have diesel generators in the basement and have nasty emissions,' explains Day. 'There is a move in the industry at the moment to replace these,' he adds with reference to his glycerine-fuelled generators. Aquafuel is also working on temporary portable power for construction projects, railways and events. 'A lot of these activities happen in urban areas where air quality is already stretched.'

In order to remove diesel generators from the energy mix, Day advocates a return to subsidies for renewable projects, calling for 'joined-up government thinking about the future' with long-term policy making.

The rules of Formula E also seem to be stimulating efficiency-saving research. Modifications of the motor, inverter and gearbox that comprise the drive train have been allowed since season two. However, teams' battery types and identical 180kW charge power for the E-Prix are all the same. Recharging is not possible throughout the race. Drivers complete one mandatory pit-stop, then leap, dash and dive into a second fully-charged car. Getting the most laps possible out of the first car enables them to drive more aggressively and faster in their second. 'Fierce technological competition between the teams has resulted in efficiencies of over 90 per cent,' according to Formula E's title sponsor Julius Bär, 'compared to just 25 per cent for a conventional road car with a gasoline engine.' Second-generation Formula E cars will be able to complete the entire race on one battery in the upcoming 2018/19 season.

The next big breakthrough in further decarbonising Formula E and EV cars in general will be the extraction of glycerine from saltwater algae. The chemistry is already there. Research at the University of Greenwich in London is looking to make the process viable at scale. Unlike terrestrially-grown vegetable oils or animal fats, this marine harvest does not compete for fresh water, nor require trees to be cleared for its


Renault driver Nico Prost inspects the damage to his car following a spin during qualifying

plantation or rearing and has a high biomass yield per square metre. Climate change and rising sea levels will hit the developing island nations hardest – countries that were not responsible for creating the associated emissions. Perhaps a future where these states profit from selling glycerine farmed on newly saline shores to the polluters would have an element of poetic justice.

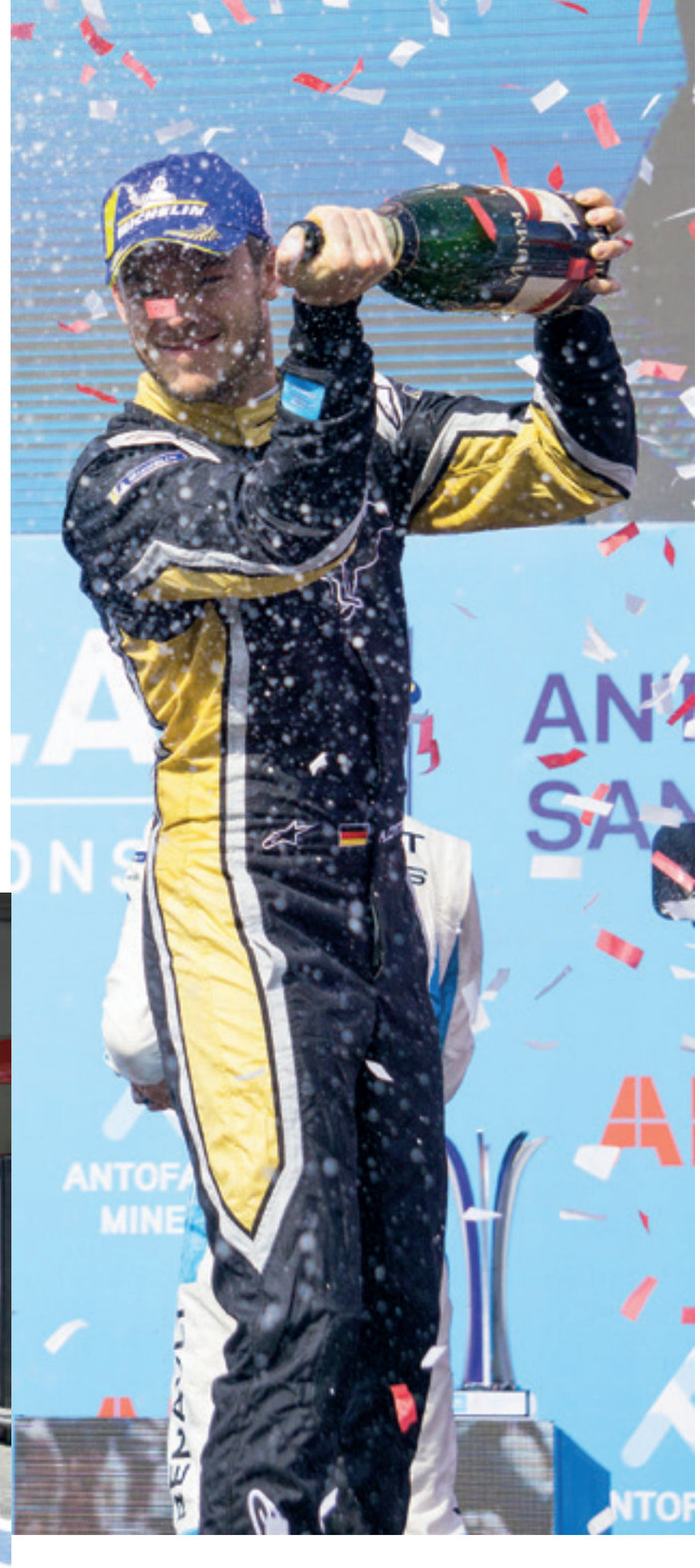
## EV IDOL

Back in Santiago, the E-Prix lights turn green. Helicopters weave through tower blocks of craning spectators. Balconies, terraces and rooftops are crowded with colourful flags and expectant Latino faces. Down at the first hairpin, bodies press against the railing. The air begins to ring in anticipation of a lightning strike. Supercars swarm the first kilometre parallel to the Mapocho River. Racers' visors reflect the glaciers of the Andes from where the river's water began its journey. Yesterday this was a traffic jam – the 5,000m peaks obscured by smog.

Formula E is a potentially powerful advert for future EV road car adoption. In 2013 Formula E reported that it had commissioned Ernst & Young to investigate just how big an impact the sport could have – not just on the EV car market, but also on health and the downstream implications for $CO_2$ emission reduction. The full findings haven't been shared publicly, but highlights posted on Formula E's website very favourably claim that by 2038 the sport could result in between 55 and 77 million new EV car sales, a reduction of 900m tonnes of $CO_2$ and a €25billion saving in healthcare and productivity from pollution reduction.

'To be reaping those kind of numbers suggests we are talking about uptake by mainstream consumers,' says Stephen Skippon of the Transport Research Laboratory, a transport consultancy firm based in Wokingham. Skippon has investigated the willingness of drivers in the mass market to purchase an electric vehicle. 'People don't just buy cars for functional reasons,' he explains, 'but for symbolic reasons too.' When potential consumers were asked what an EV vehicle says about its driver, Skippon found that identity as an environmentalist is one of the common answers given. 'But the question that doesn't seem to have been asked,' he adds, 'is if that identity seems congruent with somebody who is interested in racing.'

Since 2013, Formula E doesn't seem so interested in whether the sport will raise fans' awareness of EV's climate and pollution mitigating qualities. Attention instead seems to have turned to promoting EV sales and an attempt to consume our way out of the climate and air pollution problem. 'You won't buy an electric car just to save the environment,' said Team Audi's Mark Schneider in a *Daily Mail* interview this July. 'You want to buy a car because it's sexy, fast or cool.'




Techeetah driver Andre Lotterer celebrates his second-place finish


Currently two cars are used for each driver per race, but by next season cars should be able to finish using a single charge

**Race visors reflect the glaciers of the Andes. Yesterday, the peaks were obscured by smog**

Julia Palle is the sport's sustainability consultant and says she agrees with Schneider's consume-for-the-climate assessment. She does qualify her comment, arguing that the championships' electric technology drive, its enhancement of EV image as well as its engagement of businesses and institutions will offer a solution to air pollution in city centres. Palle, however, also acknowledges that Formula E has not published the life cycle assessment of emissions associated with the championship for the last two seasons and that since this time they have also discontinued offsetting these emissions. Regarding the asserions made on the back of the Ernest & Young study, Palle concedes 'we have not renewed the study since.' She also added: 'However, we can see that global trends are showing growing demand in all markets for EV.'

So while costs, infrastructure and efficiency of electric vehicles are improving, hopes for climate change mitigation by the Formula E championship seem to be pinned on unabated consumption for now. Simply electrifying vehicles is not the silver climate bullet. A 2017 study in the Netherlands found that EVs can still be used unsustainably if consumption is driven by economic rather than environmental reasons. Behaviours such as charging the vehicle in the evening can 'threaten grid stability and reliability' requiring the use of coal-fired power stations to meet the demand and leading to higher $CO_2$ emissions. Mining company Antofagasta Minerals, the unlikely title sponsor for the Santiago race, says on its website that 'electric cars use on average four to five times more copper than a conventional one.' Elon Musk, CEO of Tesla, was also in the *Financial Times*' headlines during the race weekend with the announcement of his talks with Chilean lithium mining company SQM regarding use of its product in his EV batteries. Whether Santiago will be showcasing this technology again is still unclear, with this year's unresolved race objections creating a 'TBA' void at the start of the 2019 calendar.

As Champagne corks are popped in front of crowds on Plaza Italia by winner Jean Eric Vergne and runner-up, Techeetah teammate Andre Lotterer, the race's advert for aspirational EV adoption is complete. FIA's Formula E initiatives make it the one of the more environmentally responsible motorsports and in 2018 it achieved the ISO 20121 standard for event sustainability management.

However, with car manufacturers showcased at the street level races and allowed to advertise their electrified products on the homepage of the Formula E website, it seems unlikely that environmental responsibility will soon become the principal selling point of EVs. The automobile as a status symbol that needs regular updating will be the enduring paradigm for a while yet. In the meantime, the electric cool of street racing might be a useful stopgap for tackling climate change and air pollution, as society addresses deeper concerns of changing attitudes and consumption patterns. ●