

Fuel Cells and Hydrogen Undertaking (H2020)

European Partnership on Clean Hydrogen
(Horizon Europe)

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Lietuvos energetikos institutas, 2021

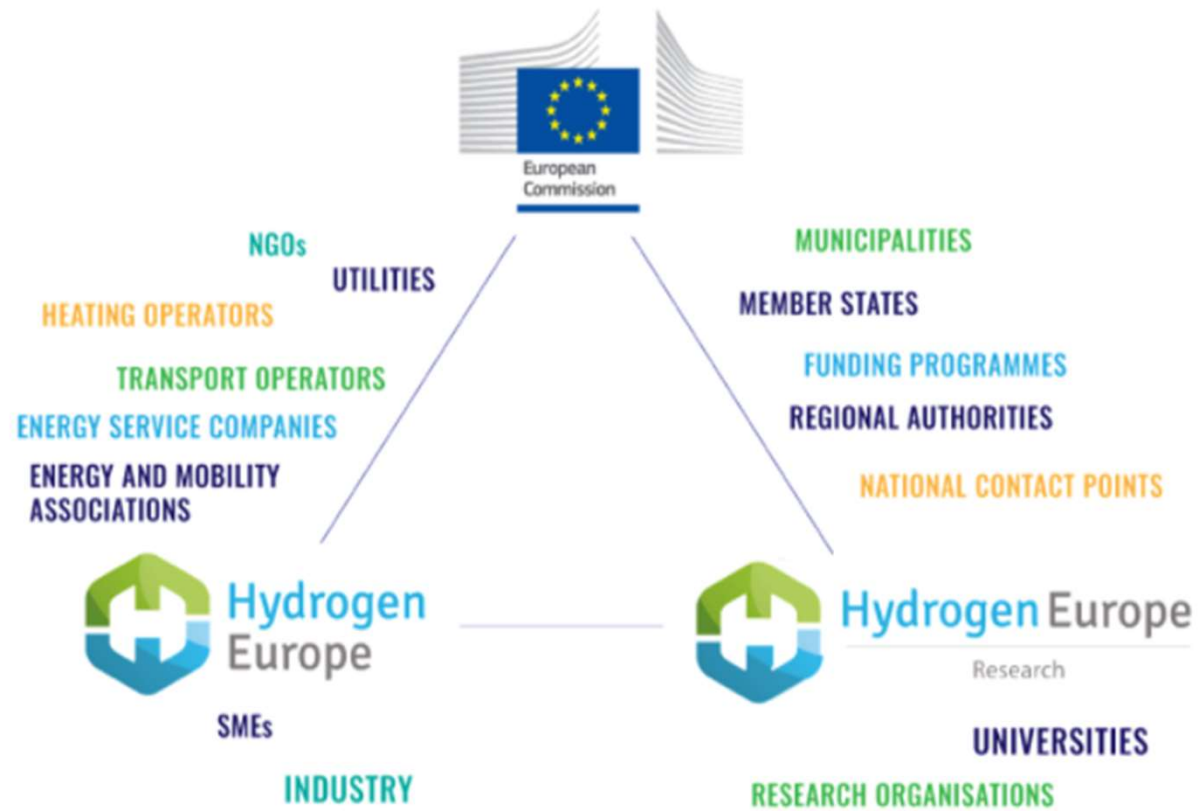
Our mission

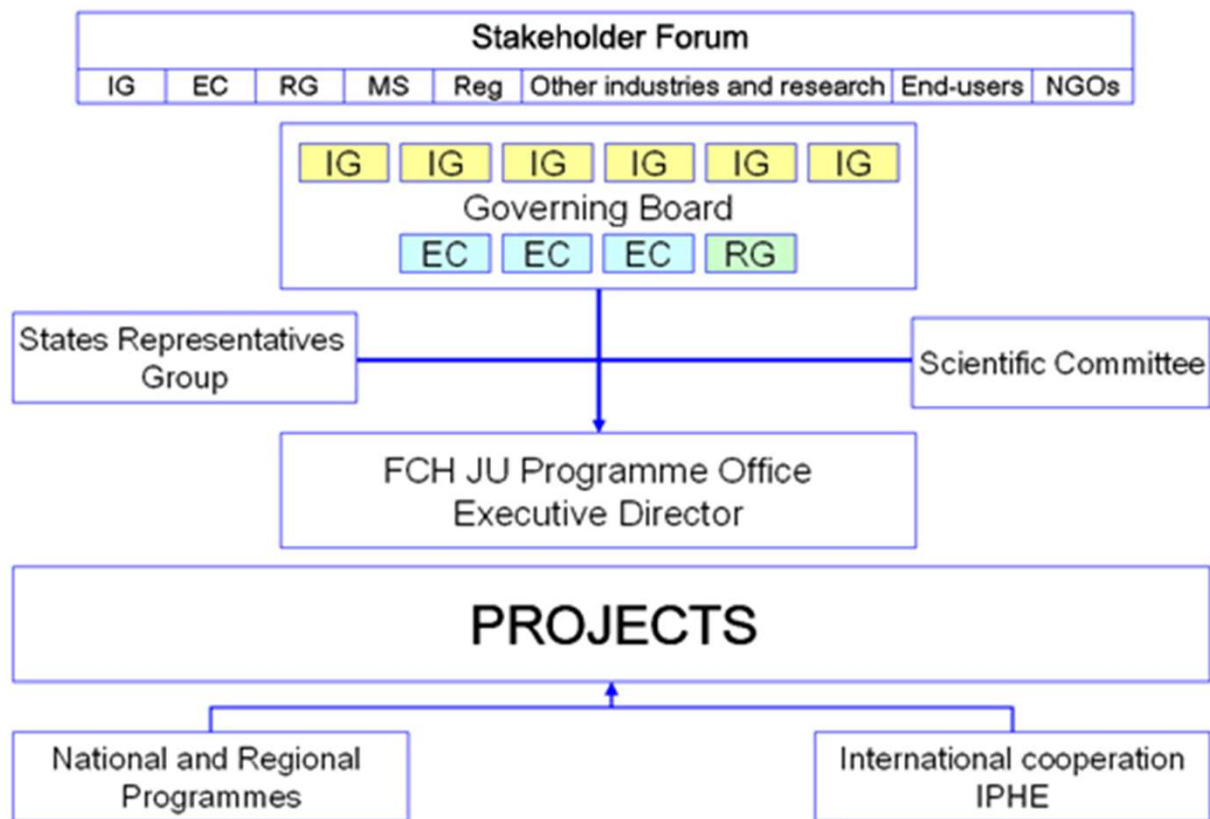
At Fuel Cells and Hydrogen Undertaking (FCH JU), we are working to facilitate the market introduction of FCH technologies in Europe and realise their potential in a carbon-clean energy system. We do this by implementing an optimal research and innovation (R&I) programme in order to develop a portfolio of clean, efficient solutions that exploit the properties of hydrogen as an energy carrier and fuel cells as energy converters, to the point of market readiness.

Our objectives

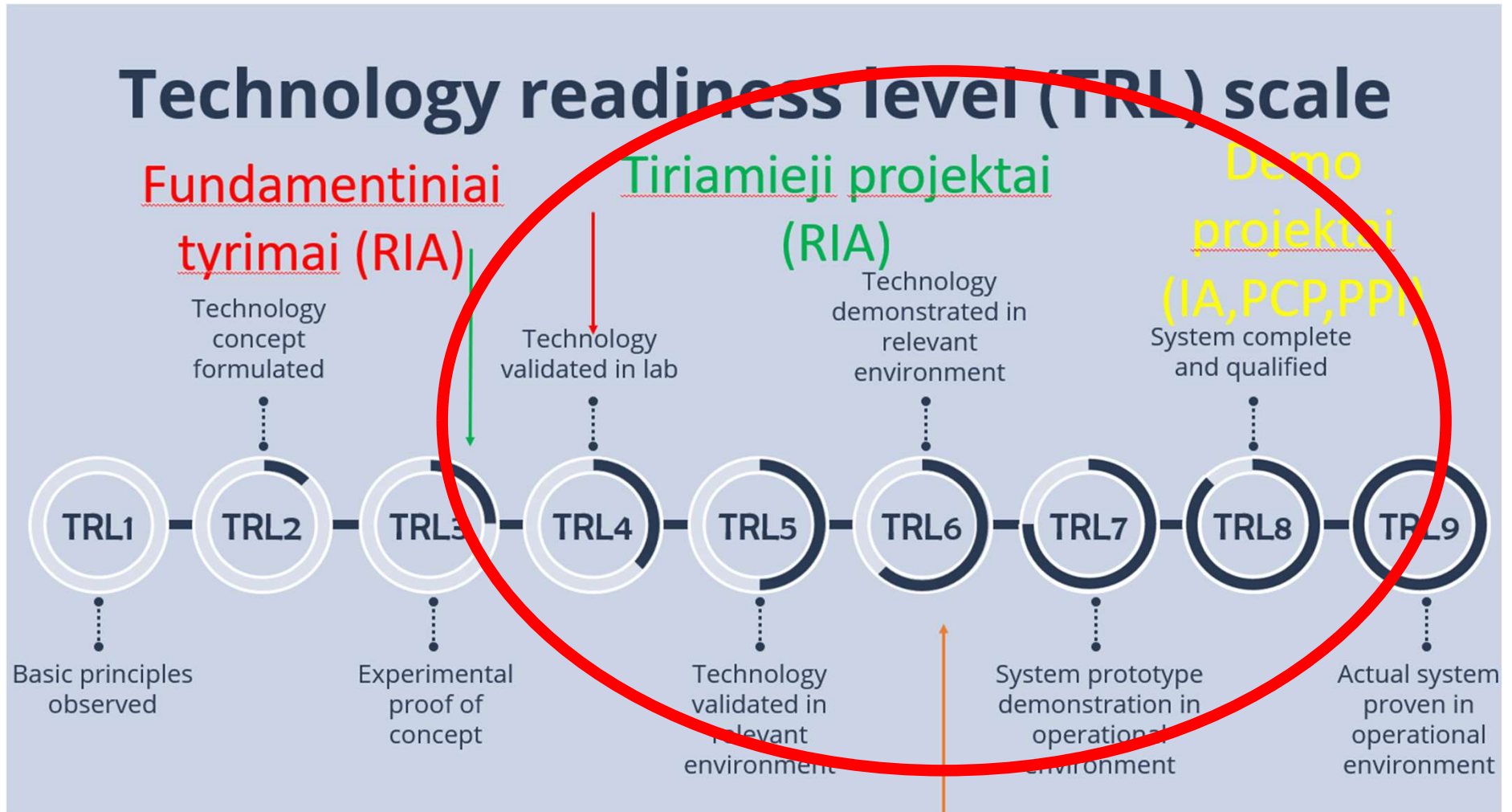


A public-private partnership





Finansuojamų projektų TRL



Finansai:

TABLE 2: IN-KIND CONTRIBUTIONS AND EU CONTRIBUTIONS FOR GRANTS UNDER CALLS 2014-2020

CALL	NUMBER OF PROJECTS	TOTAL EU CONTRIBUTION (A)	COMMITTED IN-KIND CONTRIBUTIONS (IKOP) FROM MEMBERS (B)	COMMITTED IN-KIND CONTRIBUTIONS FROM NON-MEMBERS (C)	TOTAL COMMITTED PRIVATE CONTRIBUTIONS (D = B + C)	TOTAL COMMITTED EU + PRIVATE CONTRIBUTIONS (E = A + D)
YEAR		IN EUR MIL.	IN EUR MIL.	IN EUR MIL.	IN EUR MIL.	IN EUR MIL.
Call 2014	15	80.15	26.82	15.63	42.45	122.60
Call 2015	15	107.09	61.76	59.80	121.56	228.65
Call 2016	19	88.02	5.99	89.77	95.76	183.78
Call 2017	24	114.32	16.37	103.14	119.51	233.83
Call 2018	19	71.61	17.41	37.17	54.58	126.19
Call 2019	17	69.13	15.24	73.07	88.31	157.44
Call 2020	22	86.84	14.98	22.67	37.66	124.50
TOTAL	131	617.16	158.58	401.25	559.83	1 176.99

Projektai: transporto sektorius

FIGURE 4: DISTRIBUTION OF FCEV DEPLOYED BY FCH 2 JU DEMONSTRATION PROJECTS

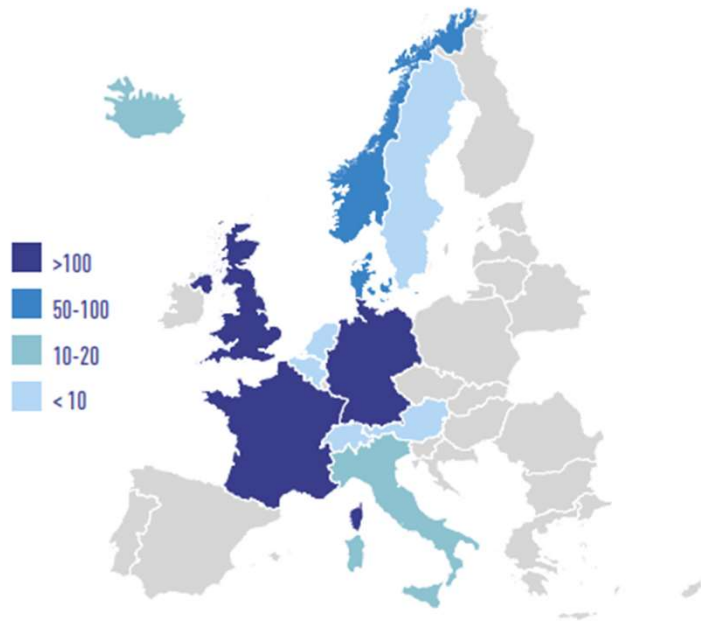


FIGURE 5: CUMULATIVE DISTANCE DRIVEN BY FCH 2 JU DEMONSTRATED LIGHT-DUTY VEHICLES

Light-duty vehicle demonstration

Fleets are bringing the mileage with 100% FC availability

Achievements

- 1860 cars funded/963 cars deployed
- 378 595 h of operation/1072 t H₂ consumed
- 1700 t CO₂ avoided



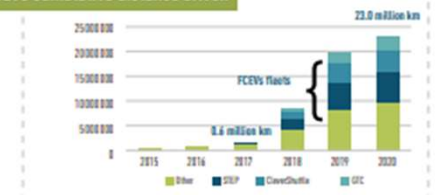
86% of the vehicles in fleets; confirming the business model

Hydrogen:
- 85% lowcarbon H₂, out of which
21% renewable H₂

New models coming into the projects

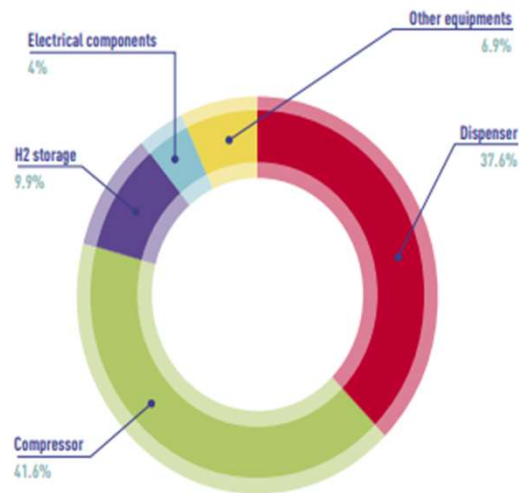


FCEVs cumulative distance driven



Projektai: transporto sektorius

FIGURE 6: HRS DOWNTIME CAUSES



Projects report that 85 % of dispensed hydrogen (based on mass) was certified as low carbon. Of this, renewable hydrogen accounted for 21 %. The average cost of renewable hydrogen is **9.29 €/kg**, thereby achieving the related MAWP 2020 target. The average capital expenditure (CAPEX) for hydrogen stations is 7.8 €/kg/day, which remains higher than the expected MAWP 2020 targets for station CAPEX of 4-2.1 €/kg/day.

FCB demonstration

European hydrogen FCB deployment activities can be considered as state-of-art worldwide, having grown considerably between earlier projects and the most recent ones, as shown in Figure 8. In this respect, the targeted bus prices, hydrogen price and maintenance costs are well in line with the MAWP targets.

FIGURE 8: EVOLUTION OF FCB IN OPERATION IN THE EU

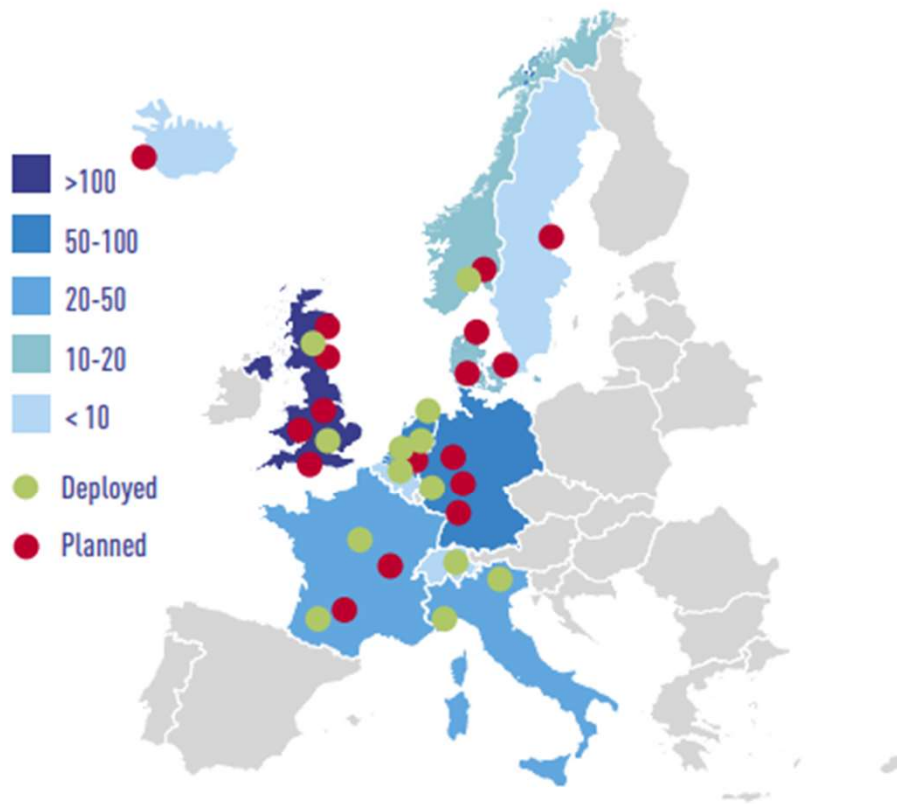


In 2019, FCH 2 JU bus demonstration activities concerned the projects High V.LO-City⁴⁹, HyTransit⁵⁰, 3EMOTION⁵¹, JIVE⁵² and JIVE 2⁵³. The High V.LO-City project ended in December 2019 and has put 14 FCBs into operation in four demonstration sites. In addition, HyTransit (which finished in March 2019) has deployed six hybrid FCBs in daily fleet service in Aberdeen (Scotland), operating them for four full years on long inter-urban routes. In 2019, 55 buses were deployed by FCH 2 JU in 10 cities, as depicted in Figure 9, while 290 FCBs – mainly from JIVE and JIVE 2 – are planned for deployment in the next few years.

<https://www.fch.europa.eu/sites/default/files/FCH-20-001-Annual%20report%202020%20%28ID%2011531857%29.pdf.pdf>

Projektai: transporto sektorius

FIGURE 9: DISTRIBUTION OF BUSES DEPLOYED BY THE FCH 2 JU DEMONSTRATION PROJECTS



<https://www.fch.europa.eu/sites/default/files/FCH-20-001-Annual%20report%202020%20%28ID%2011531857%29.pdf.pdf>

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FC applications in rail transportation

FCH technology is a promising option for replacing diesel combustion engines in rail transportation (see Figure 10). In 2019, the Shift2Rail Joint Undertaking and Fuel Cells and Hydrogen Joint Undertaking published the study 'Use of fuel cells and hydrogen in the railway environment'⁴⁴ to assess the state of the art and market potential of FCH in a railway environment. The key information identified in the study includes:

- FCH trains are cost competitive when designed for non-electrified lines over 100 km in length;
- FCH trains are especially viable for main routes with low utilisation (<10 trains per day);
- FCH trains are characterised by relatively fast refuelling (<20 minutes) and an operational time of 18 hours without refuelling;
- High hydrogen infrastructure and electricity costing less than 50 €/MWh provide favourable conditions for FCH technology.

FIGURE 13: HYDROGEN POTENTIAL FOR USE IN TRAINS



<https://www.fch.europa.eu/sites/default/files/FCH-20-001-Annual%20report%202020%20%28ID%2011531857%29.pdf.pdf>

Projektai: šilumos ir elektros gamyba

FIGURE 17: DEPLOYED AND PLANNED FC MICRO-CHP INSTALLATIONS ACROSS THE EU

Europe market is in the order of 18 000 systems



Complementary to heating system



Replaces heating system

FC micro-CHP deployment geography

- 15 000+
- 400-3000
- 200-400
- 70-200
- 1-70



Planned and deployed



*Applications field under German KfW since 2016

Projektų dalyviai

FIGURE 25: FCH CONTRIBUTION BY COUNTRY (IN EUR)

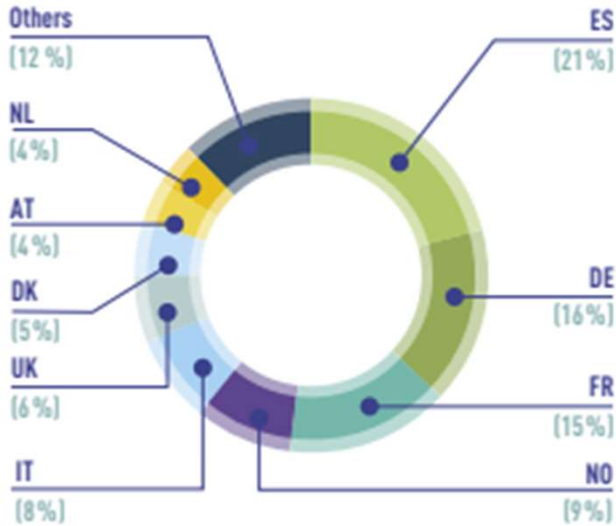


FIGURE 26: NUMBER OF PARTICIPANTS BY COUNTRY



<https://www.fch.europa.eu/sites/default/files/FCH-20-001-Annual%20report%202020%20%28ID%2011531857%29.pdf.pdf>