



Jaarsymposium Circulaire Maakindustrie

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Van circuit board naar zendmast Impact in supply chain meetbaar en zichtbaar

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What is the essence of circularity for KPN?

Materials flowing-in must be fully recyclable and preferably based on recycled content



INFLOW

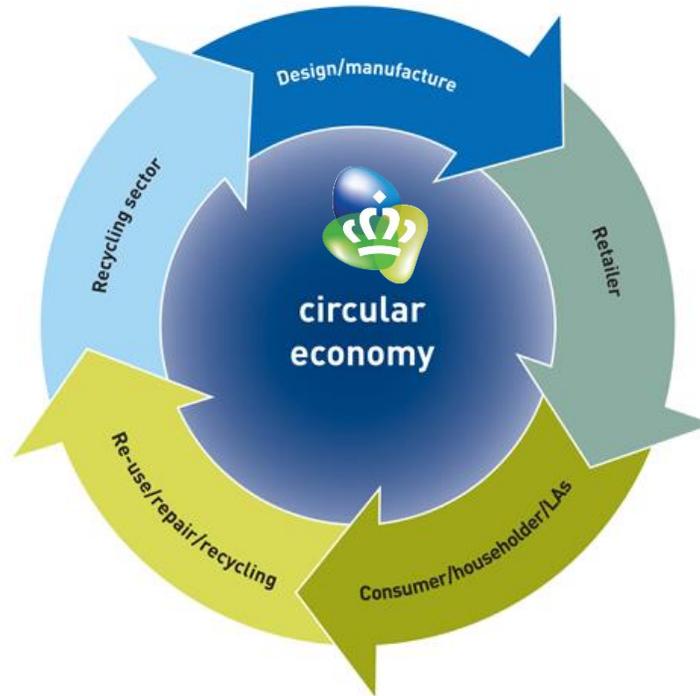
Product design:

1. Recyclability
2. Recycled content

Current KPN performance:

Products designed with recycled content %

Focus on 15 iconic products for KPN to be redesigned by 2022



OUTFLOW

End of Use Reuse & Recycling rate

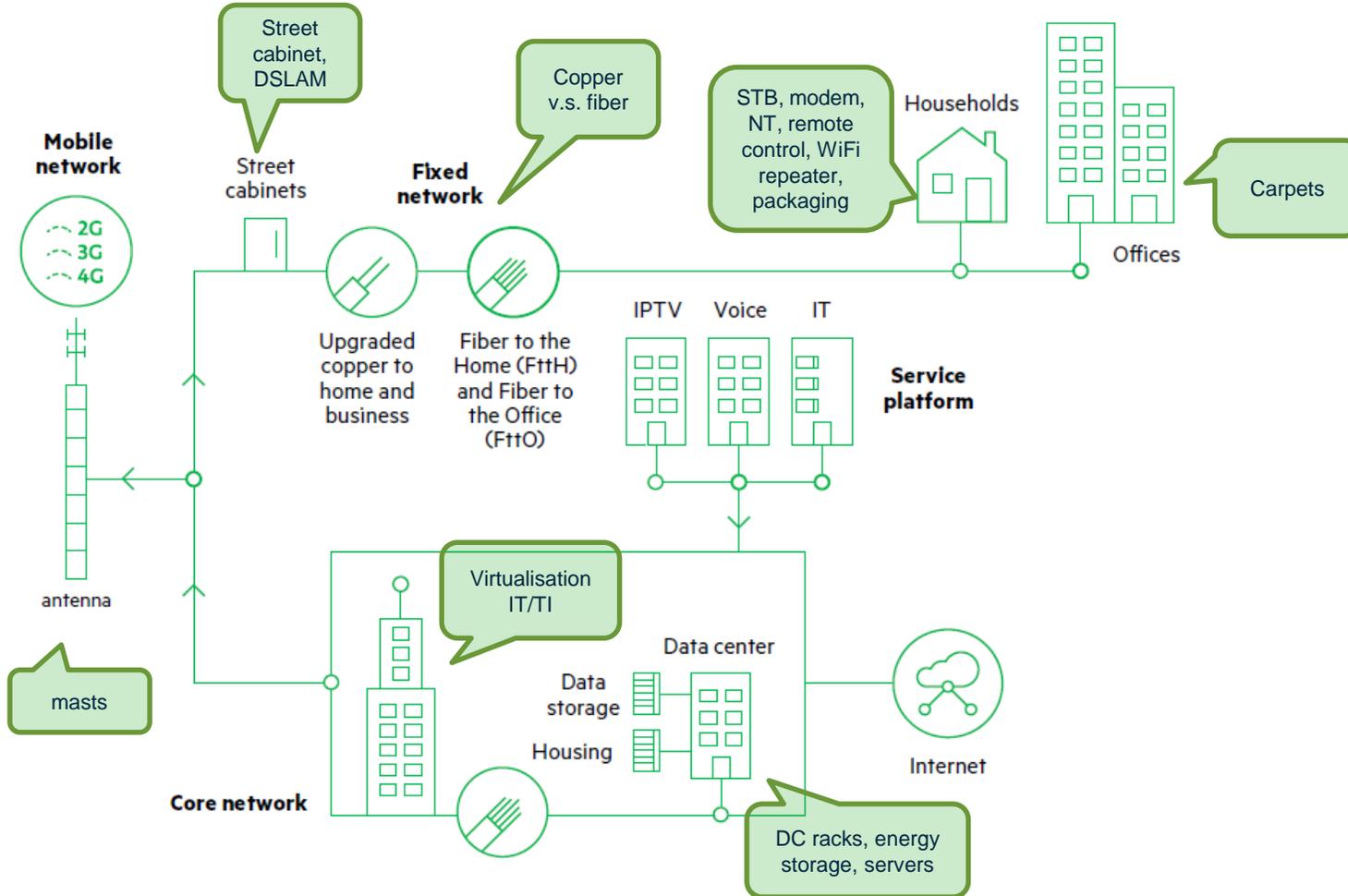
KPN performance 2019:

Reuse% + Re-cycle% 76%
Waste via Incineration 24%
Waste via Landfill 0%

Our ambition: Zero Waste

Product design: measuring circularity of typical KPN products

We focus on 15 product passports for iconic products covering KPN's network and CPE



KPN introduces products with improved circular design



We focus on design, re-use & recycling as part of our 2025 circular ambition

Target 2022: 15 products improved for circular design – 8 realized until now (we focus on key products only)

Entry point internet
25% less plastic



Deep sleep mode:
80% less energy



900 >> 250 kilo



Modular Design
Recycled plastic cover

Modem

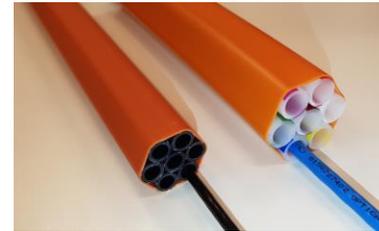


Black covers
made of
recycled
plastic

Smaller design
64% less plastic



Digitenne - cover
recycled metal



Pilot eco-slim
fibre cable & duct

What are critical raw materials (CRMs)?

As defined by the European Union [1]

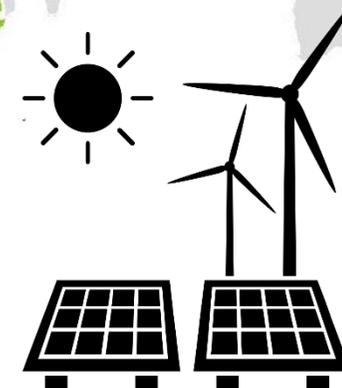
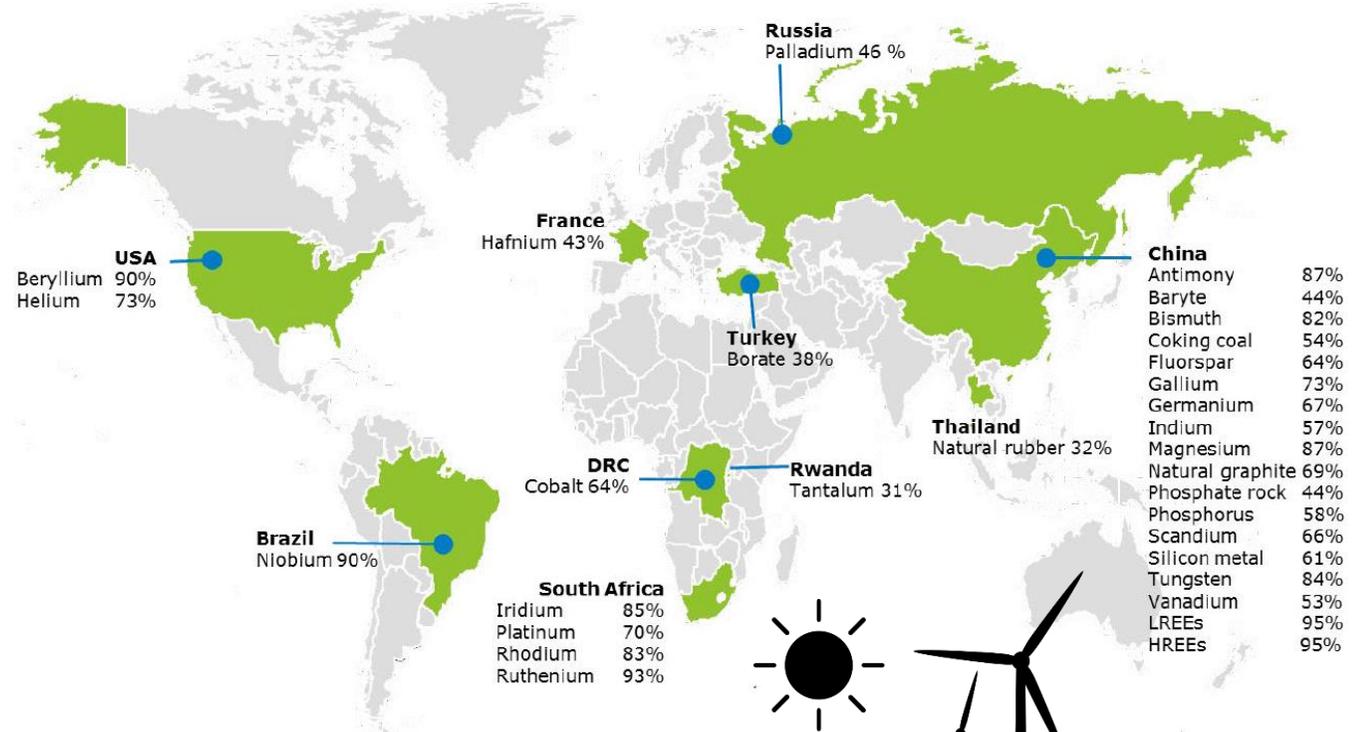


Critical raw materials³⁾

- Form base of important economic activities
- Supply security is at high risk

Reasons for criticality

- Geopolitical risk
- Demand risk
- Scarcity risk
- Environmental risk
- Social risk
- [...]



[1] British Geological Survey, Bureau de Recherches Géologiques et Minières, Deloitte Sustainability, European Commission, Directorate-General for Internal Market, I., Entrepreneurship and SMEs, & Toegepast natuurwetenschappelijk onderzoek. (2017). Study on the review of the list of critical raw materials: Final report. <http://dx.publications.europa.eu/10.2873/876644>

Criticality assessment

Dimensions



Criticality assessment domains

Vulnerability to supply restriction

Supply risk

Environmental implications

Social implications

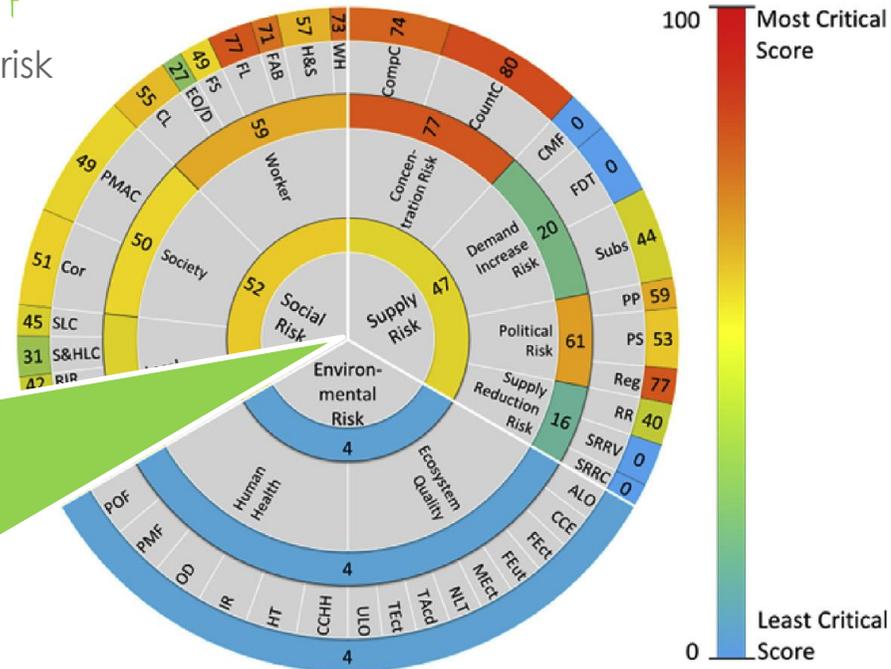
Economic risk

Reputational risk

Example result from [2]

Which material should be prioritized?

Where may KPN encounter high risks?



[2] Kolotzek, C., Helbig, C., Thorenz, A., Reller, A., & Tuma, A. (2018). A company-oriented model for the assessment of raw material supply risks, environmental impact and social implications. *Journal of Cleaner Production*, 176, 566–580. <https://doi.org/10.1016/j.jclepro.2017.12.162>

Criticality Assessment for telecommunication materials

Methodology



Step 1

Identifying key service area & equipment to investigate

- Remote control [In-home]
- Modem [In-home]
- Core router [Network]
- Blade server [Network]

Step 2

Identifying material composition of equipment with the support of suppliers

- Provision of material bills with a granularity where constituents are visible on an element level

Step 3

Conduct criticality assessment

- Collect data
- company's vulnerability to supply restriction (impact on revenue and strategy)
 - substitutability for the specific applications
 - recent data on materials and political, social and environmental practices in production countries

Step 4

Determine company's CRMs and decide on strategies to mitigate

- Define list of CRMs
- Determine roots of criticality
- Chose mitigation options according to your ability to influence and the magnitude of impact

Critical Raw Materials

Occurrence



Number of products the material is contained in:



1 H Hydrogen 1.008																	2 He Helium 4.003	
3 Li Lithium 6.94	4 Be Beryllium 9.012																	
11 Na Sodium 22.990	12 Mg Magnesium 24.305																	
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.97	35 Br Bromine 79.904	36 Kr Krypton 83.798	
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium (97)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	53 Te Tellurium 127.60	53 I Iodine 126.904	54 Xe Xenon 131.293	
55 Cs Cesium 132.905	56 Ba Barium 137.327	* 57 - 70	71 Lu Lutetium 174.967	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	78 Ir Iridium 192.227	79 Pt Platinum 195.084	80 Au Gold 196.967	81 Hg Mercury 200.592	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium (226)	** 89 - 102	103 Lr Lawrencium (262)	104 Rf Rutherfordium (267)	105 Db Dubnium (270)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (270)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (281)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (289)	116 Lv Livermorium (293)	117 Ts Tennessine (293)	118 Og Oganesson (294)
*Lanthanide series			57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.242	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.045		
**Actinide series			89 Ac Actinium (227)	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)		



From simple PCBs



Modem



Core router



Blade Server



...to complex PCBs

Remote Control

Mitigation strategies

Example: Rhodium



Rhodium (Rh)

Function:

- Plating of electric contacts
- Constituent of capacitors and resistors



Hotspots

Companion metal, hardly substitutable
Political stability/regulations
80% South Africa

Mitigation strategy

Internal & External

- Design for reuse/refurbishment/recyclability
- Use secondary material source
- Substitution to non-critical materials

- Transparency
- Due diligence on suppliers
- Sourcing CERA (CERTification of RAW Materials) certified components/materials

Associated risk

● Economic risk

● Environmental risk

● Social risk

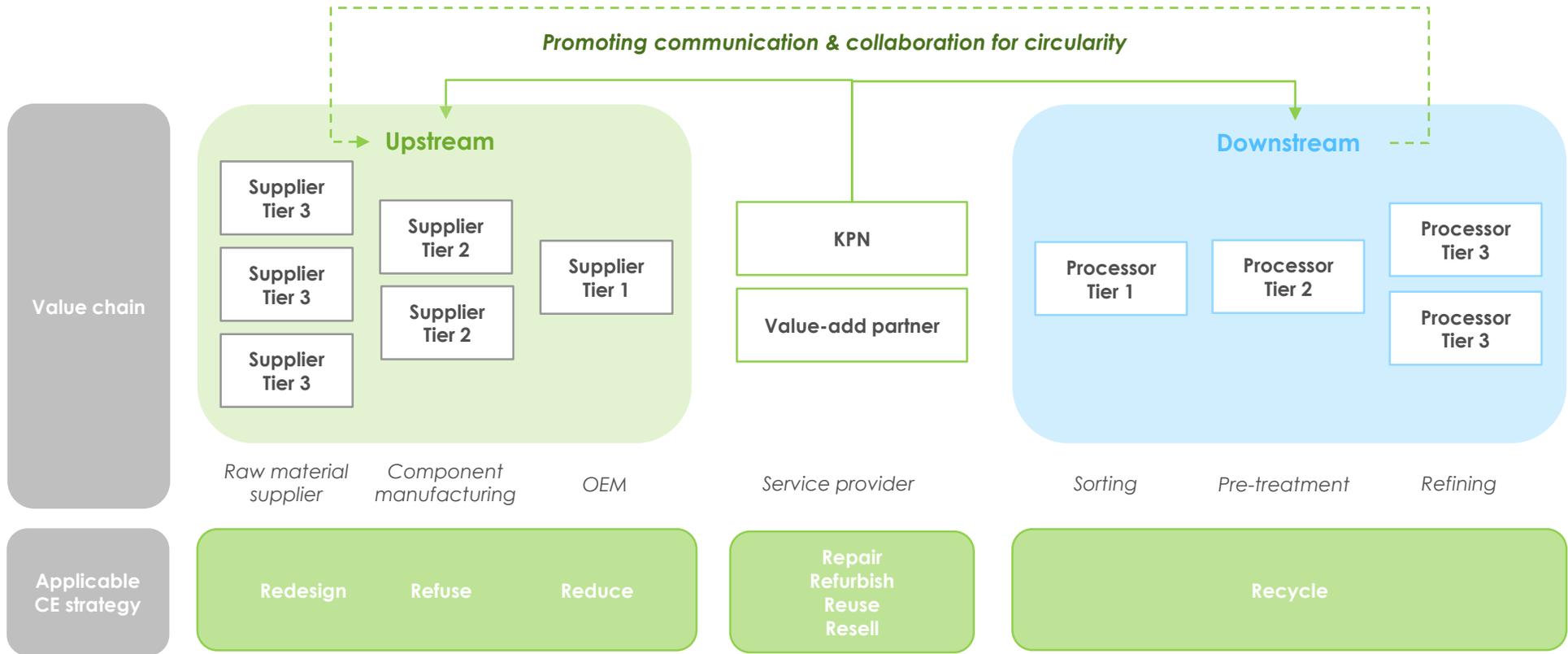
Systemic

- Demand-based recycling targets
- Research subsidies and standardization
- Trade agreements

- Translating externalities into pricing
- Trade agreements incl. social and environmental conditions for goods

Follow up research: Circular use of CRMs

Achieving circularity of CRMs in KPN's value chain



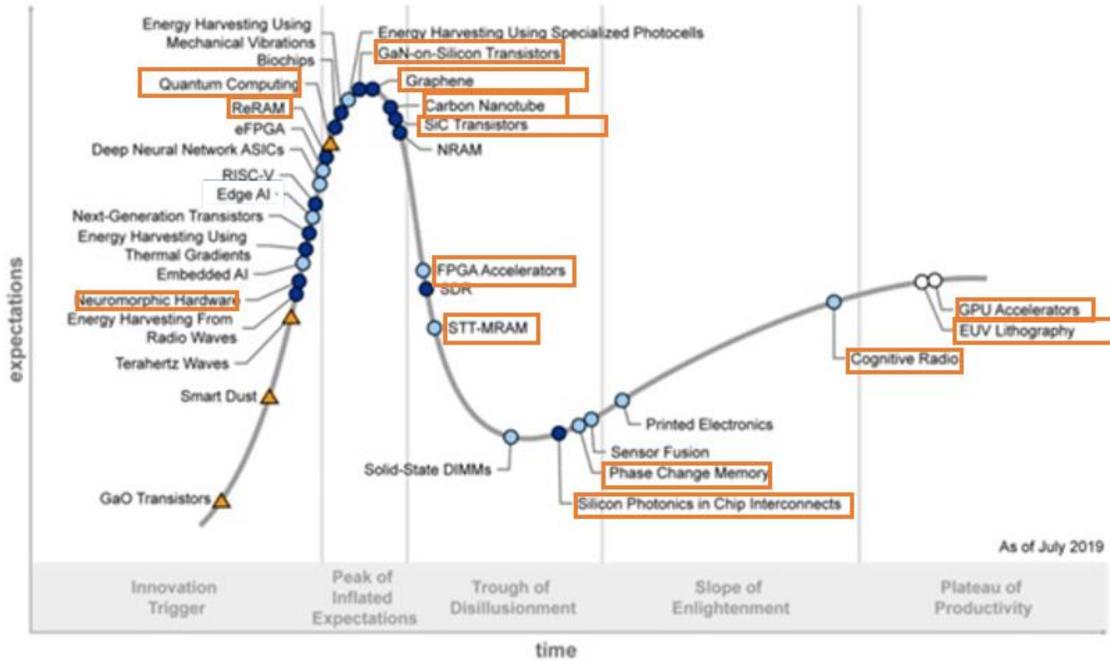
How can circularity of CRMs be achieved via circular strategies suitable for product value chain and collaboration among our partners?

Follow up research: Impact of CRM on future technology

Strategic importance for KPN



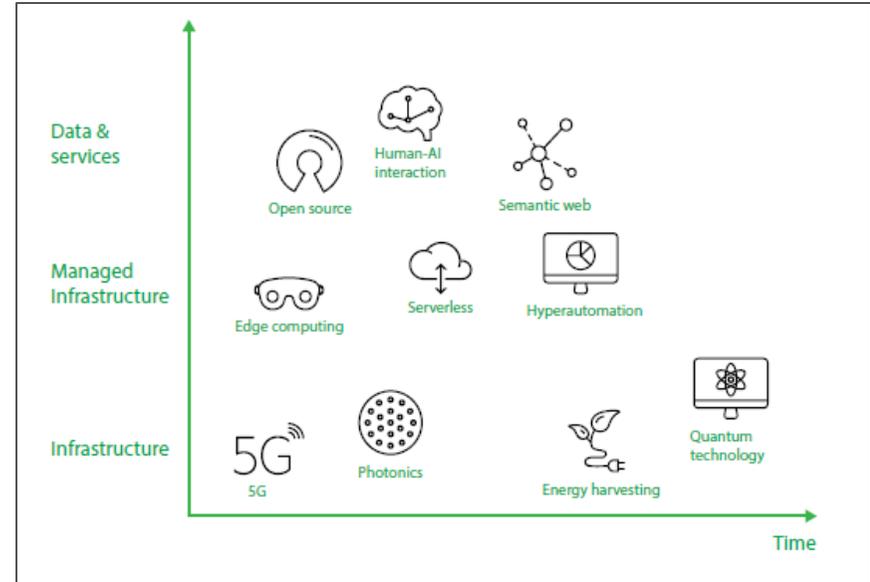
Hype Cycle for Semiconductors and Electronics Technologies, 2019



Plateau will be reached:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

Source: Gartner ID: 370206 Named-by-(SIA,-2017)¶



KPN Technology Book

- ➡ What impact do new technologies have on our network architecture and equipment?
- ➡ Which CRMs will be required?
- ➡ How can we build supply chain resilience?

Thank you

