

**JANUARY TO APRIL 2020** 

PROF. DR. KAI HOBERG

# DEMAND AND SUPPLY FOR PERSONAL PROTECTIVE EQUIPMENT IN THE COVID-19 CRISIS

**NEWS OVERVIEW** 

### **AGENDA**



## **Overview of PPE related news**

Ad-hoc supply chains for medical equipment

# THE COVID-19 CRISIS TRIGGERS AN UNPRECEDENTED GLOBAL DEMAND INCREASE FOR IN PPE





Germany bans export of medical protection gear due to coronavirus



Prices for PPE has increased massively, in some cases more than 1000%



U.S. Health and Human Services suggest the country needs 300 million N95 masks

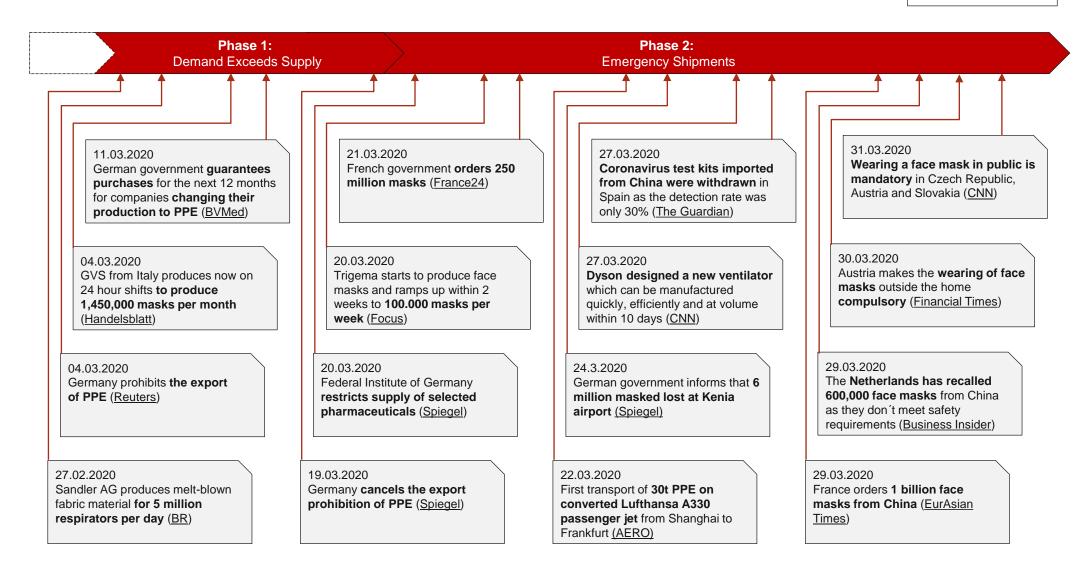
## The New York Times

White House Airlifts Medical Supplies From China in Coronavirus Fight

#### PPE DEMAND AND SUPPLY IN EUROPE 1/2

SELECTED NEWS FOCUS EUROPE





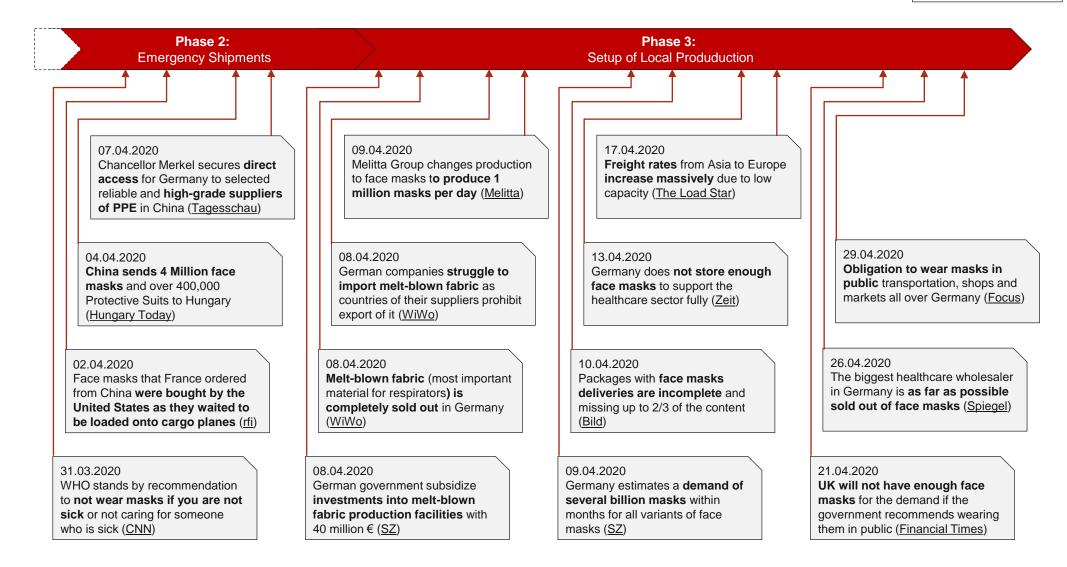
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Source: KLU analysis

#### PPE DEMAND AND SUPPLY IN EUROPE 2/2

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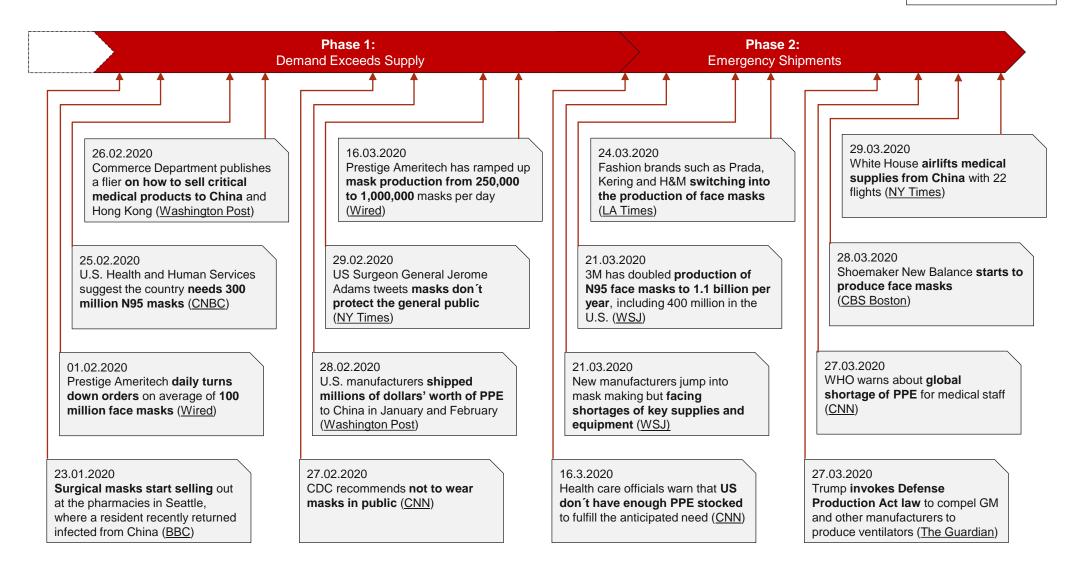
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#### PPE DEMAND AND SUPPLY IN USA 1/2

SELECTED NEWS FOCUS USA





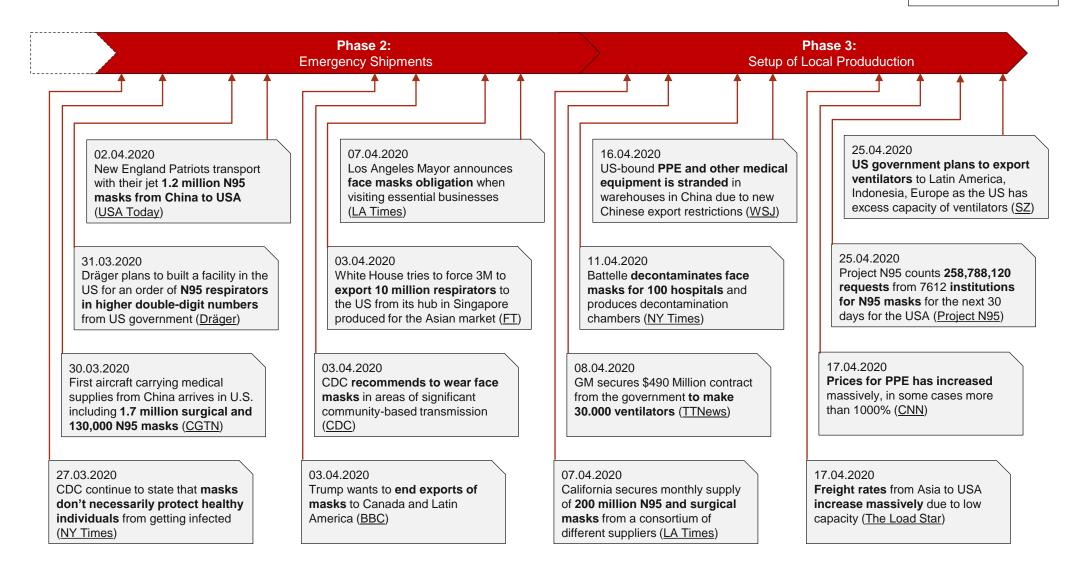
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#### PPE DEMAND AND SUPPLY IN USA 2/2

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Source: KLU analysis

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#### Phase 3: Phase 1: **Demand Exceeds Supply** Setup of Local Produduction 16.03.2020 03.02.2020 08.02.2020 12.03.2020 Price for a ton of melt-down fiber in Shanghai makes wearing masks More than 80 million counterfeit It is obligatory to wear face China has increased from 6,000\$ masks in public in the first to mandatory in public places or faulty masks had been seized to 60,000\$ (npr) provinces of China (Bangkok Post) in February (LA Times) (Xinhuanet) 16.03.2020 06.02.2020 01.03.2020 31.01.2020 China has increased face mask China is capable of producing 20 3000 companies added PPE Taiwan anticipates a high demand production to 200 million per day on face masks and starts million masks and 600,000 N95 production to area of operation in (npr) rationing them through a weekly masks per day (Inkstone) the Chinese commercial register in allowance (The Guardian) January & February (Tagesspiegel) 04.02.2020 14.02.2020 13.03.2020 30.01.2020 Face mask exports from China to China imports within a week 56 China orders 145 million masks More than 1700 Chinese medical other countries are still restricted million respirators and masks from Egypt to tackle coronavirus workers have already been through the government from suppliers outside of China epidemic (The New Arab) infected also due to scant supply of PPE (NY Times) (NY Times) (NY Times) 23.01.2020 03.02.2020 08.02.2020 12.03.2020 Face masks are now mandatory Wearing a face mask in public BYD produces daily 5 million face China has increased face mask to wear in Wuhan (CNN) becomes obligatory for more than masks and is the first car production from 20 million to **300 million people** in China (Nau) manufacturer in China to produce 100 million per day (South China masks for retail sale (Tagesspiegel) Morning Post)

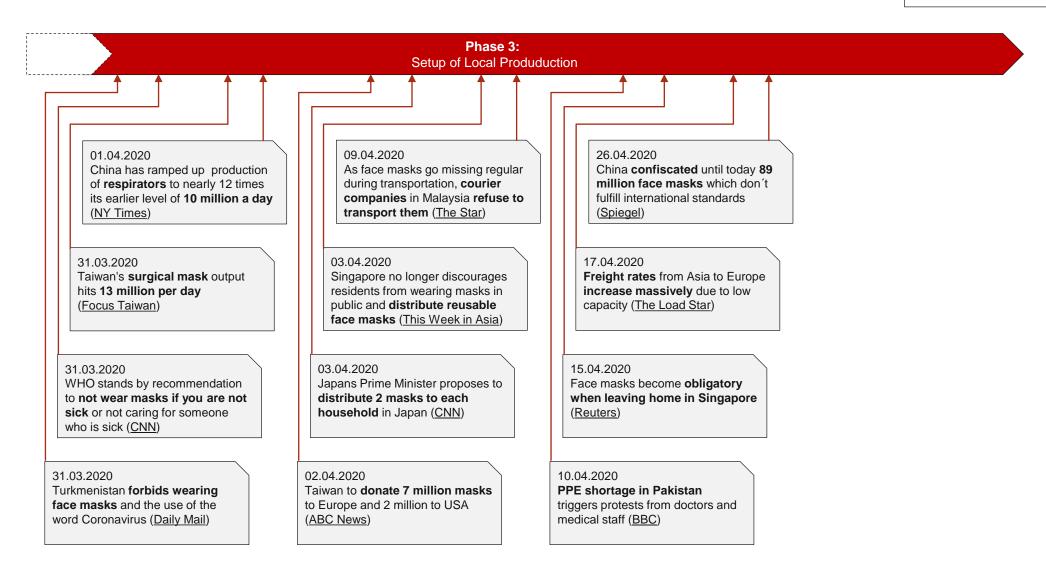
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Source: KLU analysis

#### PPE DEMAND AND SUPPLY IN ASIA 2/2

SELECTED NEWS FOCUS ASIA





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#### AGENDA



Overview of PPE related news

Ad-hoc supply chains for medical equipment

#### CRITICAL MEDICAL PRODUCTS IN THE COVID-19 CRISIS



**STATUS** 

**APRIL 1, 2020** 

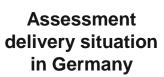
**Disinfectant** 

**Protective equipment** 

**Ventilators** 

**Drugs** 



















# FOR MANY PRODUCTS WE SEE A VERY HIGH INCREASE IN DEMAND WHILE PRODUCTION STILL APPEARS STABLE



### **Supply**

- Export bans on medical products
- Delays due to border controls
- Limited transport capacities
- Production downtimes due to quarantine measures
- ...



#### **Demand**

- Increasing replacement demand due to real consumption
- Panic buying by end customers
- Speculations by middlemen
- Stockpiling purchases by governmental institutions

. . .

#### THE DEVELOPMENT OF DEMAND CANNOT BE REFLECTED BY NORMAL SUPPLY CHAINS



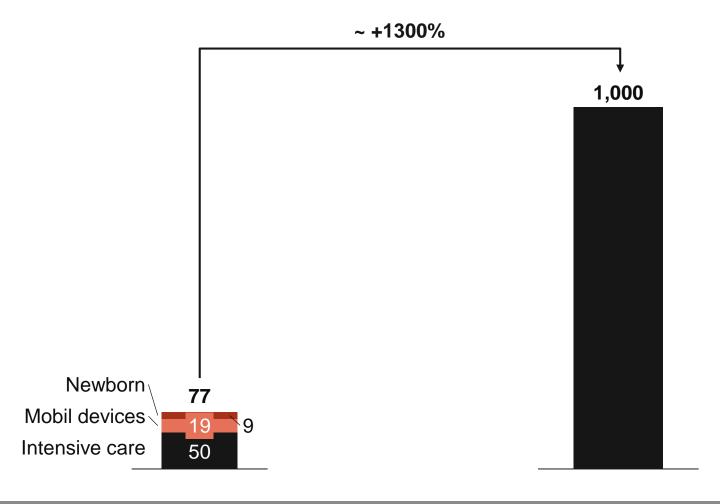


- Worldwide, in ,000s -

#### **Potential demand 2020**

- Worldwide, in ,000s -

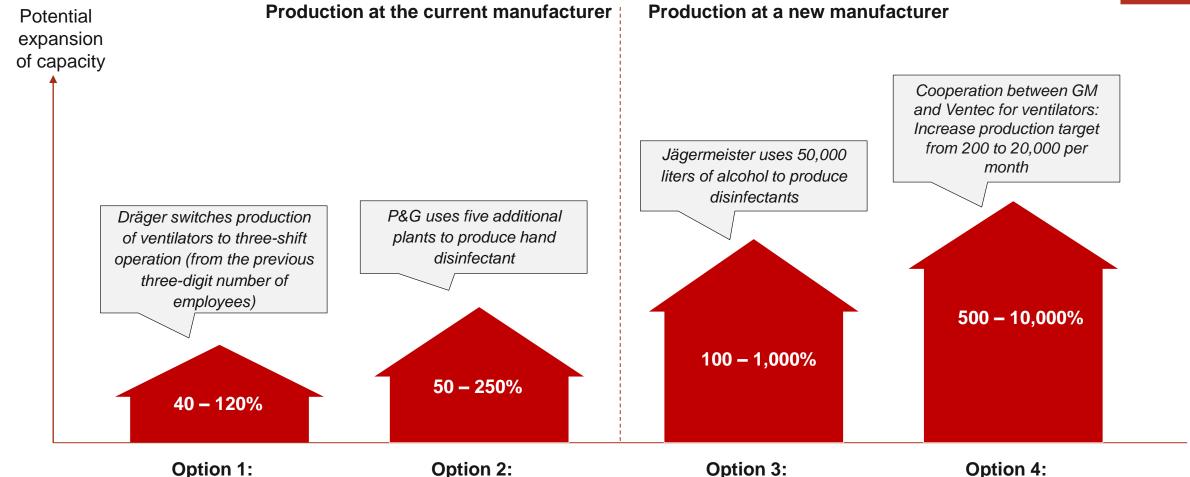
## EXAMPLE: VENTILATORS



- Estimated global available ventilators for intensive care medicine 2019: 400-500 thousand
- Industry sales 2019: US\$ 2.8 billion (including US\$ 1.3 billion for consumables such as filters, tubing and face masks)
- Top manufacturer of ventilators for intensive care medicine:
  - Getinge (Sweden) 22%
  - Hamilton (USA/CH) 22%
  - Dräger (GER) 16%
  - Mindray (China) 10%
  - Medtronic (Ireland/USA) 5%
  - Löwenstein (GER) 3%
  - Vyaire Medical (USA) 3%
  - GE Healthcare (USA) 2%
  - Other: 17%

#### OPTIONS FOR THE EXPANSION OF PRODUCTION THROUGH AD-HOC SUPPLY CHAINS





Option 1: Excess work on previously used

machines / facilities

Option 2:
Expansion of production on new plants / factories at the current manufacturer.

Expansion of production on existing plants of new manufacturers

Option 4:
Cooperation and transfer of production to new manufacturers

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SLIDE 13

#### CHALLENGES OF AD-HOC SUPPLY CHAINS



- Coordination with new SC partners (e.g. investments, IT)
- Quantity planning
- Sale after the end of the emergency

• ...

## **Planning**

## **Engineering**

## **Purchasing**

### **Production**

### **Distribution**

- Trade-Offs
- Certification
- Engineer-to-Available-Supply
- ...

- Bottlenecks in raw materials / components
- Identification of alternative suppliers
- ...

- Quality
- Machine bottlenecks
- Staff bottlenecks
- ..

- Allocation in case of excess demand
- Security
- . . .

#### DEVELOPMENTS IN SUPPLY CHAINS FOR FACE MASKS



## EXAMPLE SUPPLY CHAIN MASKS WITH HIGH FILTRATION

# Mechanical engineering

- Reicofil (Troisdorf)
   manufactures melt
   blown machines to
   produce high-tech
   nonwoven fabrics
- One plant produces filter material for up to 1.8 million FFP2/3 masks per day
- Delivery time: 3,5 months
- Prices: from 3.8 million euros

## Raw material production

Sandler AG
 (Schwarzenbach)
 currently supplies fine
 filter nonwoven fleece
 materials for up to five
 million FFP2 face masks

#### **Mask production**

 Dräger manufactures FFP2 masks in plants in Sweden and South Africa (production by welding)

Ad-Hoc Supply Chain

- Strong import dependencies for face masks: e.g. USA with import share of 95% for surgical masks and 70% for masks with high filtration
- Increase in production of all mask types in China from 10 million per day in 2019 to 200 million per day in March 2020 (including 600 thousand FFP2)
- US manufacturer 3M has doubled worldwide production of FFP2 masks (US Standard: N95) since the beginning of the year to around 4 million per day
- USA could need more than 3.5 billion FFP2/N95 masks
- Market prices for FFP2 masks rose from 0.40 Euro to over 10 Euro, but also raw materials, e.g. fine filter fleece in China from 6,000 to 60,000 US\$ per ton

# 3D PRINTING ENABLES DIGITAL DESIGNS TO BE CONVERTED INTO FINISHED PARTS WHEN BOTTLENECKS OCCUR



**EXAMPLE:** 3D PRINT

Component

## Spare part

Valves for connecting patients to vital ventilators

6 hours after the inquiry ventilators of 10 patients could be supplied



#### **New developments**

Splitter connection for the supply of up to 4 persons with only one ventilator

After successful field tests the approval of the authorities is now expected



#### **Protective Equipment**

Frame and adjustment mechanisms that effective protect the face with a clear film

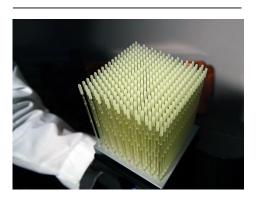
Worldwide printing in large quantities (e.g. FabLab with up to 4,000 pieces per day)



#### Test kits

COVID-19 diagnostic dipsticks with flexible nasal swabs for smears

Up to 150,000 dipsticks / day made of bio-compatible material



#### PLEASE FEEL FREE TO CONTACT ME





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