

ETH Swiss Federal Institute of Technology Zurich

IVT Institute for Transport Planning and Systems

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**Since Sydney 2000 Olympics are
catalysts for more sustainable mobilities
Towards Olympics 4.0**

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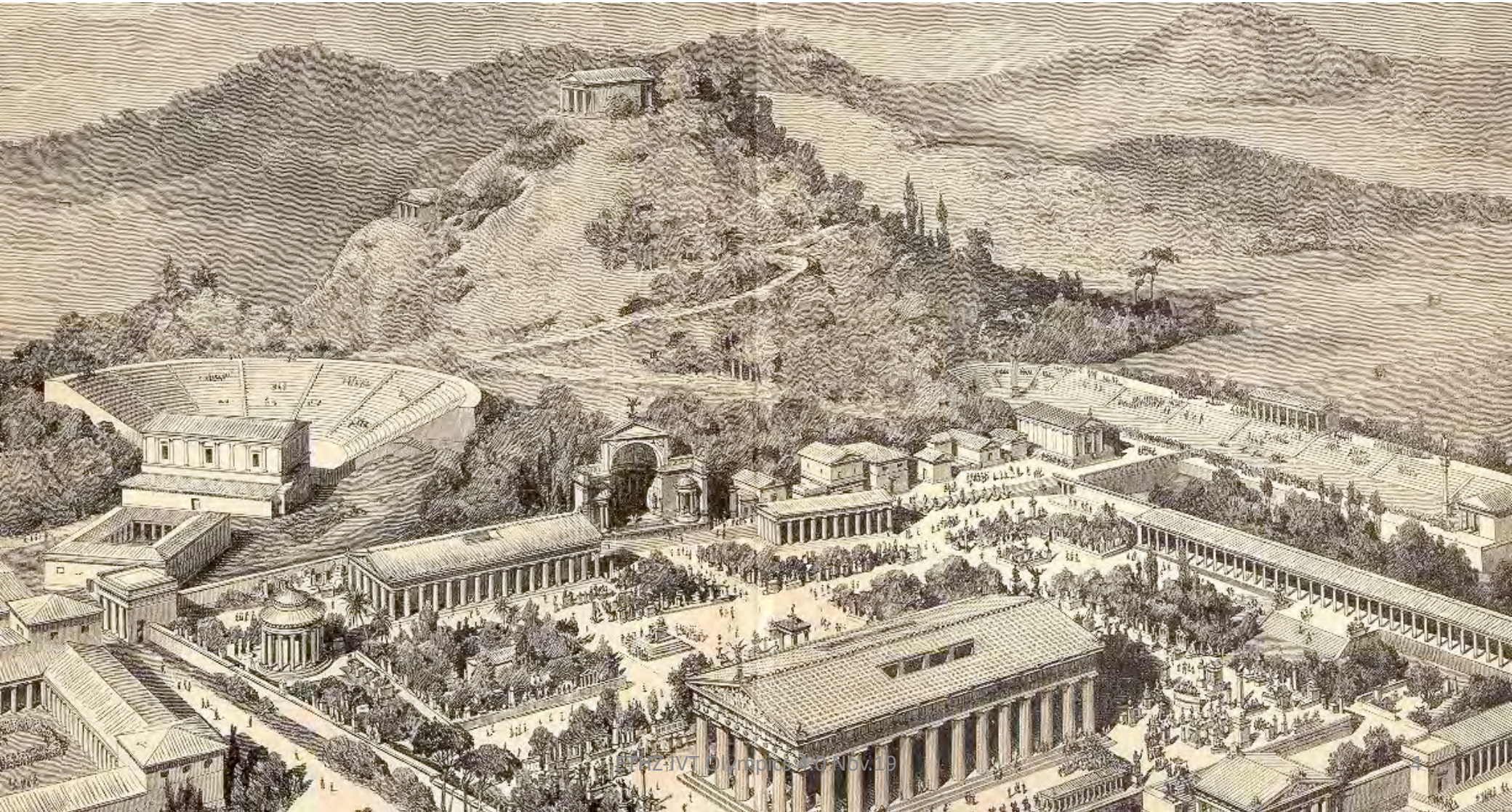
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AGENDA

- 1. From Ancient Games to World Olympic Games***
- 2. Games growth and main transport tasks***
- 3. Outstanding transport and mobility management schemes and experiences:***
 - Sydney 2000, Athens 2004, Beijing 2008***
 - London 2012, Rio 2016 and Tokyo 2020***
- 4. Mega-events and more sustainable mobilities***
- 5. IOC New Norm and Olympics 4.0***

1. Ancient Olympic Games in Olympia-Greece

Every 4 years during 1170 years from - 776 BC to + 394 AD



.....the Olympic truce.....

- **About 2700 years ago**—Nations and tribes populating today Greece—the Aegean Sea - Western Turkey and Southern Italy—were often at war on land and sea
- Olympic Games pertaining to 5-7 sports were held in OLYMPIA -
-Western Peloponesus – **every four years from 776 BC to 394 AD** –to **celebrate Peace through fair sport competition**
- Participating athletes of all tribes and clans, even enemies, would be accommodated and hosted in a common athlete camp-- the same concept as the **modern Olympic Village**

Athens 1896 - Olympic Games revival

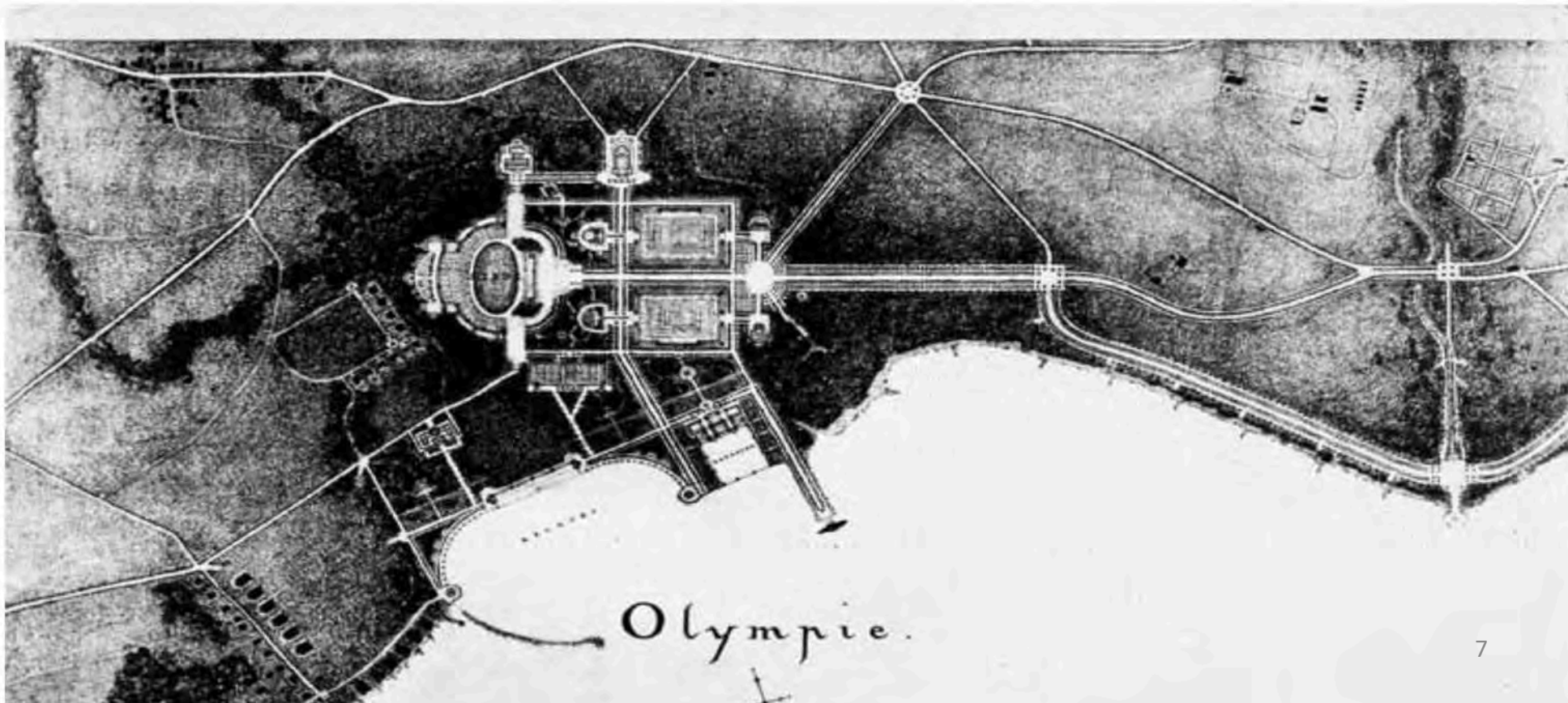


- **1896 >1500 years after Ancient Games (1170 y) and 108 years before Athens 2004**
- 14 nations (11 Europe+ Australia+ Chile+ USA)
- 241 athletes, all male
- 9 sports /14 disciplines incl. Marathon
- 10 days Games
- Panathinaiko Stadium 80'000
- 143 medals
- Th. Cook travel agency chartered a ship from Marseilles to Piraeus
- Piraeus harbor to Athens new rail line just opened

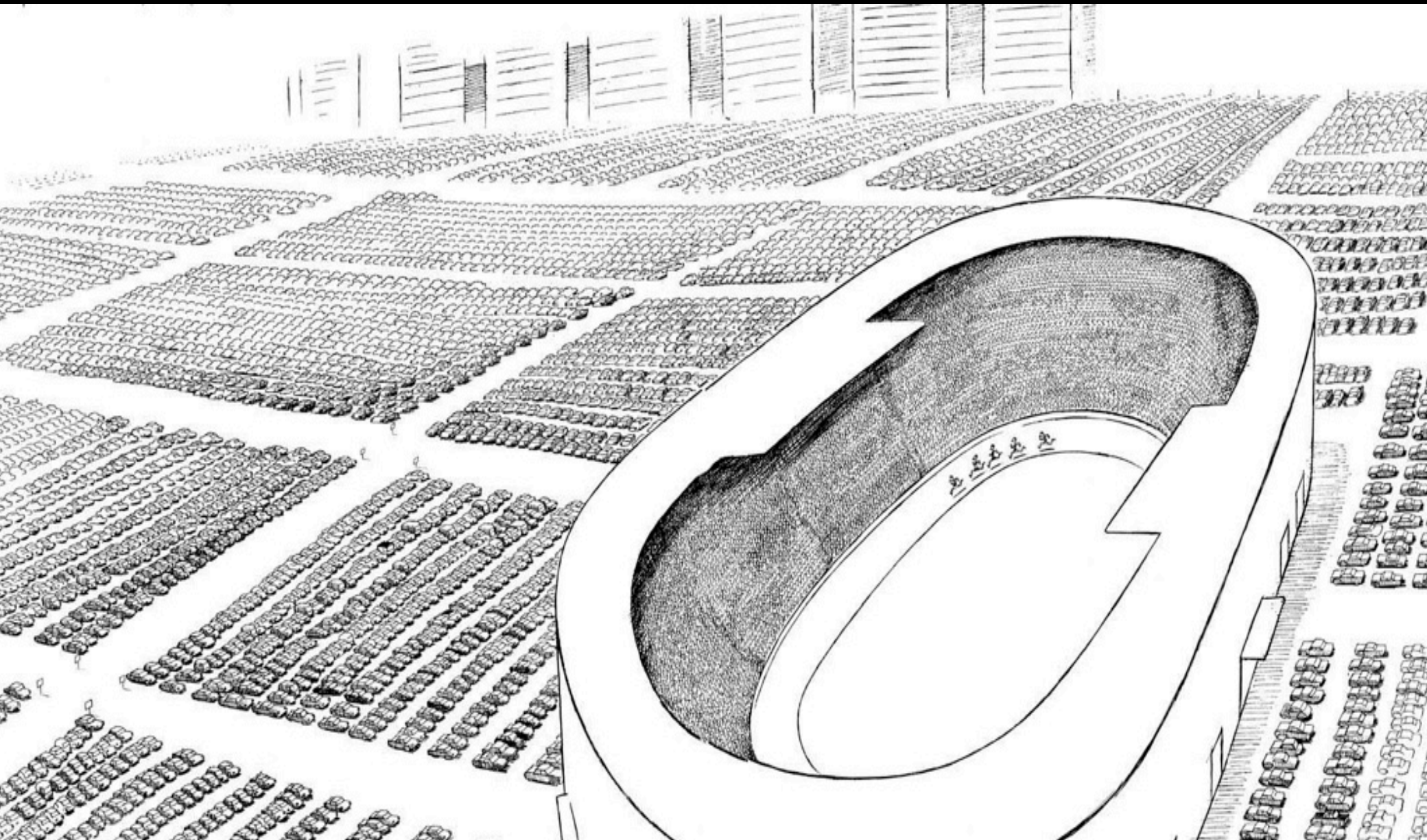
Lausanne 1915 Olympic City project at current EPFL location and near IOC Vidy HQ



**Le projet des architectes Eugène Monod et
Alphonse Laverrière (1911) à Préverenges/Morges;
en 1918, un nouveau projet est développé sur le site de Dorigny**



1970's to 2020 mega-event behavioural changes
From 85% by car to 97% by public transport



Maracana Stadium capacity changes 1950 - 2016

WCup1950 = 199'850 spect. /2016 renovated facility 78'000 spect!



Beach Volleyball at Horse Guards Parade in the heart of historical London 2012 Games



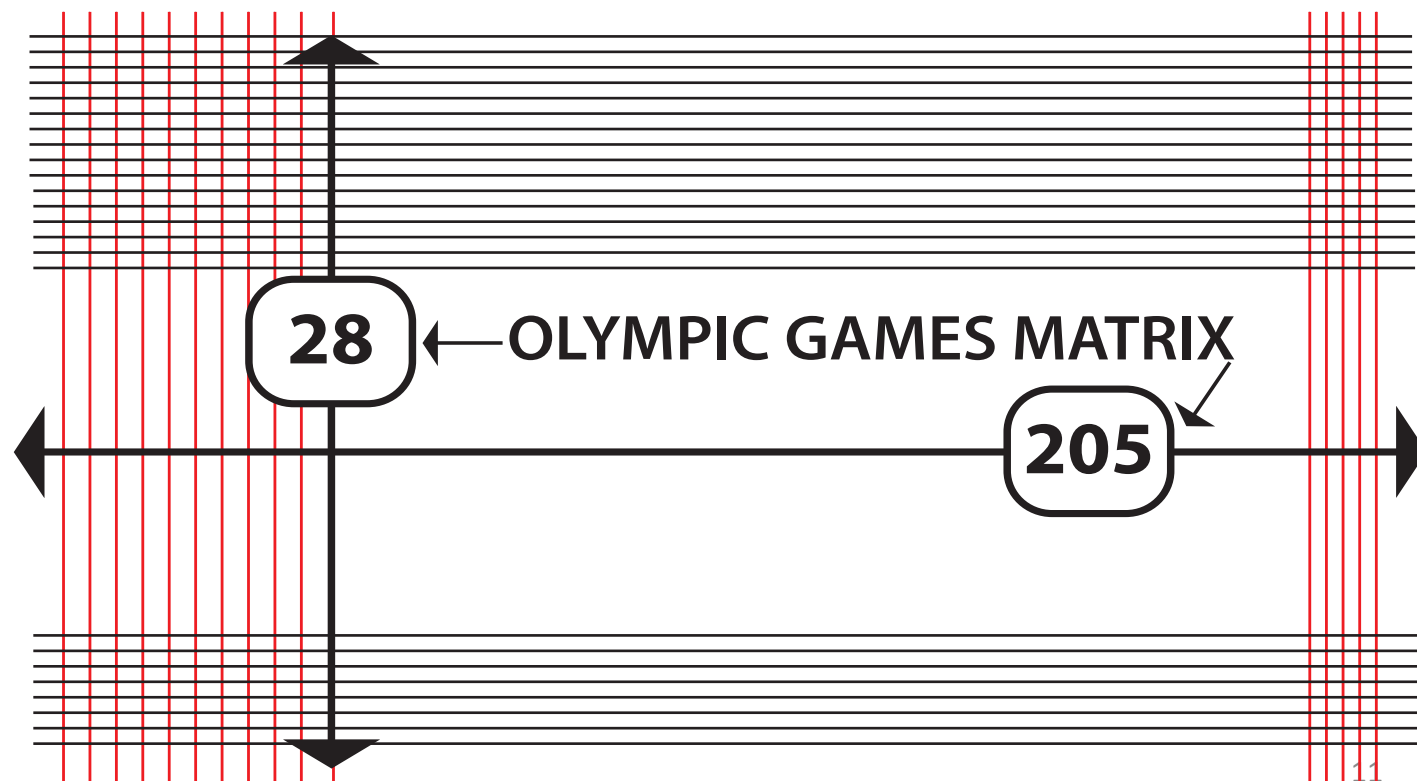
Olympic Games >28 sports / >205 nations matrix

International Sport Federations and NOC countries

A complex >28 x >205 operational matrix

NOC	205 NOC-NATIONAL OLYMPIC COMMITTEES RESPONSIBLE FOR SELECTING AND MANAGING 205 NATIONAL TEAMS DELEGATED TO THE OLYMPIC GAMES
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IF
28 SPORTS MANAGED BY 28 IF -INTERNATIONAL FEDERATIONS PART OF THE GAMES PROGRAM
FULL RESPONSABILITY FOR ALL TECHNICAL + LOGISTICAL OPERATIONS OF EACH SPORT BY EACH IF



World mega-sport-event varied typology

Outstanding operational differences in sport mega-events paradigm between:

- **One sport in many Cities**, such as FIFA World Cup 2018 in Russia, EURO 2016 in 8 French Cities, EURO 2020 all over Europe, National, continental football Tournaments , etc,
- **Many sports in one Host City**, such as the Olympics, Commonwealth Games, Asian Games, PanAmerican Games, Youth Olympic Games, etc.

Note: *When Olympic Games become too big and too unsustainable, they might evolve towards decentralised Games (like Milano-Cortina 2026 Games)*

- **Many sports in many Cities**

2. Games growth and main transport

Athens 1896 to Rio 2016 Olympic Summer Games key indicators

	1.Nb NOC.	2.Nb Events	3.Nb Comp.	4.% Female	5.Nb Media	6.Nb Volunt	7.Nb Tickets	8.Nb TV.vw	9.Total TV rights
1896 ATHENS	14	43	240	0					
1924 Paris	44	126	3100	4					
1936 Berlin	49	129	4000	8					
1960 Rome	83	150	5300	12					
1972 MUNICH	121	195	7100	15					
1984 LOS ANGELES	140	221	6800	23	9200	28000	5.7	2.5	285
1988 Seoul	159	237	8500	26	11300	27000	3.3	---	400
1992 BARCELONA	169	257	9400	29	13100	34000	3.0	---	835
1996 Atlanta	197	271	10400	34	15100	47000	8.3	---	900
2000 SYDNEY	200	300	10600	38	16000	47000	6.7	3.7	1330
2004 Athens	202	301	10600	42	21500	45000	3.6	3.9	1495
2008 BEIJING	204	302	10950	43	24600	70000	6.5	3.7	1730
2012 London	204	302	10575	44	24275	70000	8.0	3.9	2600
2016 RIO (10 est.)	206	306	11305	45	25700	27000	6.1	4.0	--?--
1984/2016 growth (%)*	45	35	65	95	175	0	5	60	--?--

Legend 1. Number of NOC – nations / 2. Number of competition events / 3. Number of athletes (± 50)
 4. Percentage female athletes ($\pm 1\%$) / 5. Number accredited medias, press and broadcasters (± 100)
 6. Number of volunteers (± 1000) / 7. Number of spectator tickets sold ($\pm 0,1$ million)
 8. Number world TV viewers ($\pm 0,1$ billion) / 9. Total TV rights (± 5 mio US\$) / 10. Dec 2016 estimates

*LA-1984 to RIO-2016 key indicators growth over 9 Summer Games or 32 years (rounded $\pm 5\%$)

Summer Olympic Games current numbers

>28 sport competition programs running simultaneously
with own schedules during 16 days—No 2 days the same

- **310* events (> 700 sessions)** during 16 days
- **11'500-12'000* athletes**, 5'000* accredited coaches and support personnel from > 205 countries
- **5'000 Olympic officials and VIP**
- **>25'000 accredited media** (TV and radio broadcasting, written press, photographers and new medias)
- **>30'000 sponsor guests**
- **150'000-200'000 workforce** including more than 70'000 volunteers
- **6 to 9 million ticketed spectators**

Two Olympic Games Transport + Mobility Plans

(1) Olympic public transport + mobility management plan

Temporary mobility plan **serving about 97% of all Olympic client mobility needs** generating 2.0 to 3.5 million additional daily travel demands in the Olympic City

By public transport 6 to 9 Mio ticket holders, among them > 1 Mio foreigners, + 2-3 Mio non-ticketed City visitors, + 150'000- 200'000 Olympic workforce and volunteers

(2) Olympic road transport + mobility management + OLN plan

Temporary mobility **plan serving about 3% of all Olympic client mobility needs**, with special requirements on security and travel times less than 45 min.

A well engineered Olympic Lane Network (OLN) and an **Olympic area 25% background traffic reduction** are often necessary to provide Games mobility satisfactory operational conditions

Games three client groups mobility management

Three generic client-groups during one month Olympics+ Paralympics:

(A) City background traffic (by all transport) keeping the City fully operational, often with ***a significant background traffic*** reduction around Olympic traffic areas

(B) Olympic Family traffic (mostly by Road), accredited ***have free dedicated mobility*** during the Games: Athletes, team + technical officials, IOC-IF-NOC rep. + staffs, Dignitaries and VVIPs, accredited Media, Medical and Security, logistical and maintenance services ...

(C) Spectators, workforce and volunteers traffic (by PT)

Spectators = primary Games hosts often ***have free transport***. Workforce and volunteers = main Games support resource, ***in principle, have free transport***

3. Transport + Mobility progresses since Sydney 2000

- **Atlanta 1996** – Olympic Games handicapped by major transport, logistics, technology and security operational failures– an Olympic counter-example!

Most outstanding 2000-2020 Olympic transport innovations:

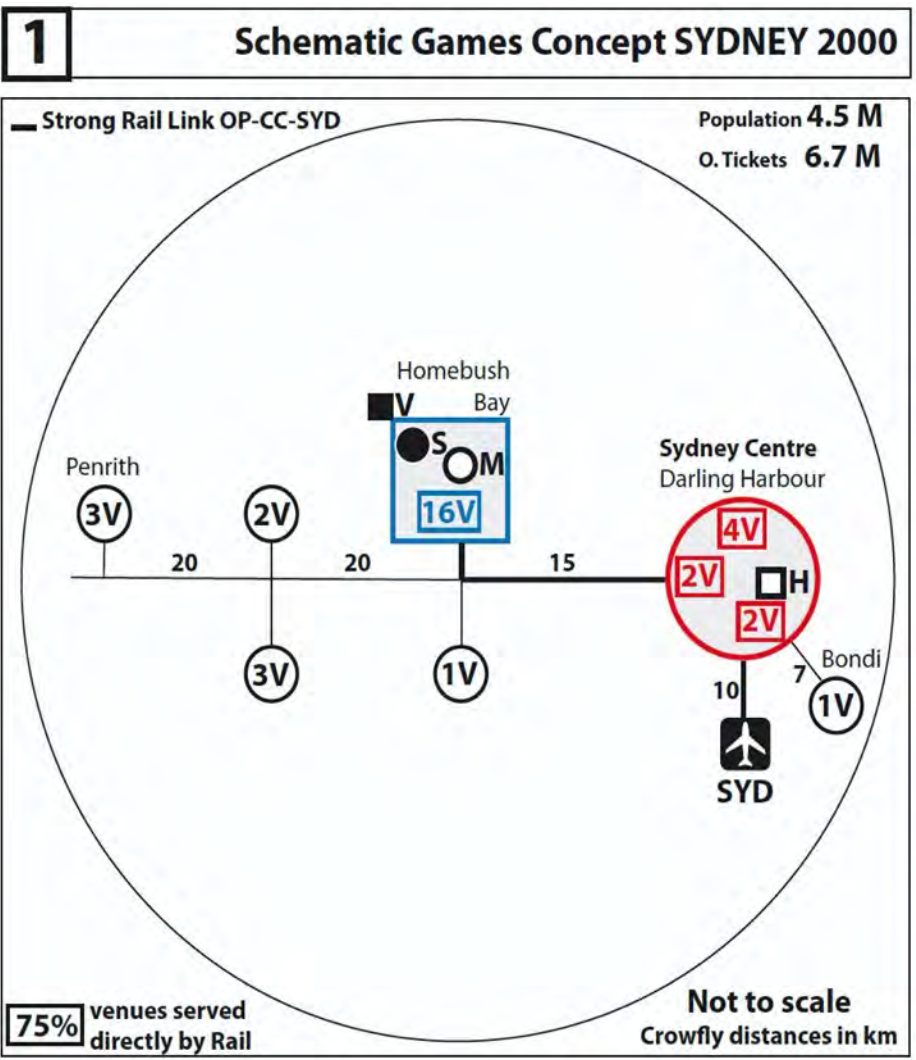
- **Sydney 2000** -- **95% spectator by public transport**, free public transport for ticketed and accredited
- **Athens 2004** – **Olympic dedicated priority lane** for reliable Olympic accredited client travel (athletes, officials, medias...)
- **Beijing 2008** -- **40 % general traffic reduction** during 60 days to improve global mobility and reduce air pollution
- **London 2012** – **Convivial outstanding public transport performance** and flexible mobility management well adapted to Games
- **Rio 2016** -- **Massively improved public transport system** – Well operated OLN system in world 3rd worst congested City– **Semi adequate City traffic management during the Games!**
- **Tokyo 2020** – **Most powerful Rail public transport system in the world**—**Games possible only with 20% Rail PT travel demand reduction / same for Expressways!**

Sydney 2000





Sydney 2000 Games structural map



Population 4.5 Mio / Spect. 6.7 Mio

- **Very Strong 16 venue Olympic Park** with Olympic Stadium 115'000 cap., IBC+MPC + nearby Olympic Village -- 15km West of Sydney CBD
- **Sydney Center second Olympic hub with 8 venues**, Olympic hotels, very strong free attractive live sites,
- **About 40km Olympic lane** route CBD -- Olympic Park
- **Rail 10km CBD-Airport + new 4 km Rail link and major new Olympic Park station**
- **Most innovative mobility Games schemes changes /see below**

Sydney innovative transport policies

- 1. >95% spectators by PT**, as well as workforce and volunteers travelled on **substantially re-enforced public transport**
- 2. “No” spectator parking** within 1km of Olympic venues
- 3. 24 hour free public transport for ticketed spectators** + Olympic officials, staff, workforce, volunteers
- 4. Sydney Olympic Park** = access 77 % by rail, 15% by express bus, <3% by walking/biking and **< 5% by car**
- Sydney (4.5 Mio) Games had **outstanding “down-under” conviviality** // going to sport venues “without a car” = **new travel behavior / rediscovery of family and group of friend rail travel**

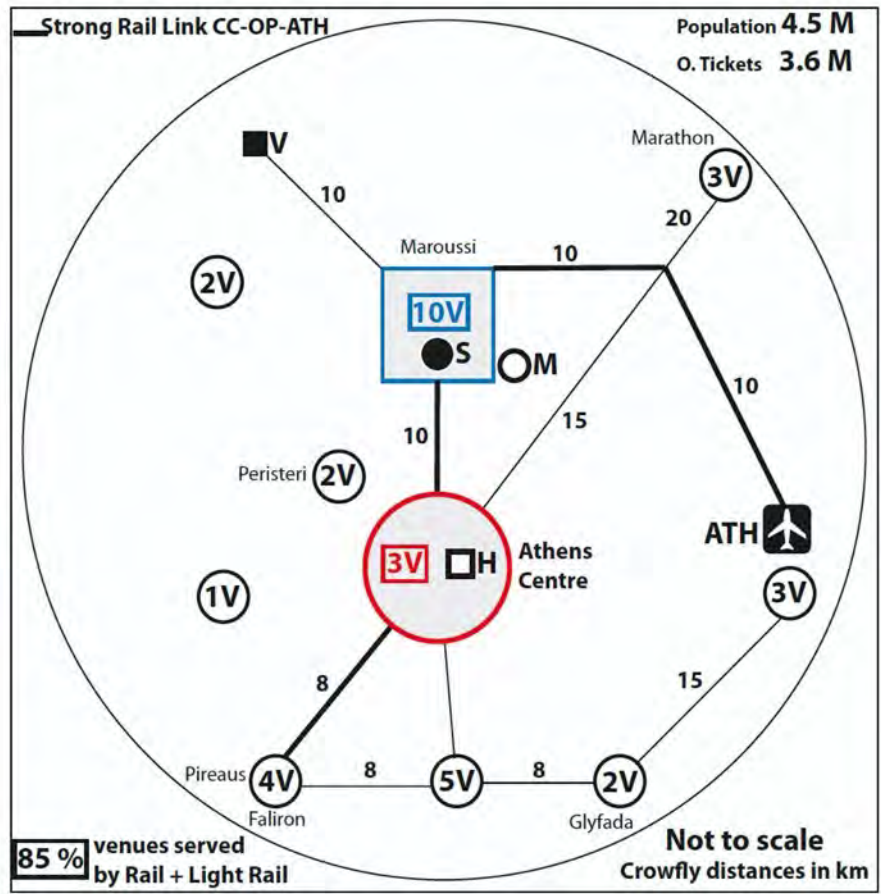
Athens 2004



...Marathon arrival in this Stadium on August 29th 2004, 108 years+ after the first modern Olympics

Athens 2004 Games structural map

2 Schematic Games Concept ATHENS 2004



Population 4.5 Mio / Spect. 3.6 Mio

- **Strong 10 venue Olympic Park** with Olympic Stadium 70'000, IBC+MPC 10km North of Athens CBD (note: Olympic Village 10km away from Olympic park)
- **Athens Old Helinikon Airport second hub with 5 venues**
- **Athens Center third Olympic hub** with only 3 venues, but Olympic hotels and Pananathinaikon Stadium Marathon arrival
- **150 km Olympic lane system** providing efficient, fast, reliable, Olympic extended family mobility
- **Metro extensions, new suburban rail with double rail connexion to new Airport and new tramway CBD to CBD-Coastline** are long term quality transport legacies

Athens bold transport infra developments

Often much delayed, Athens Transport Plan was boosted by the Games and implemented in 6 years :

- *Urban motorway system completion (+40 km)*
- *Metropolitan arterial upgrade (about 80 km)*
- *Modernization of 30 km of metro line N°1 and extensions of metro lines N° 2+3*
- *New suburban rail network connected to new Athens International airport and national rail*
- *New 23 km light rail /Athens Centre to Sea Coast*

All these transport projects (much by Rail) provided a strong boost of sustainable metropolitan legacy

Olympic dedicated lanes and client-group buses

Athens 2004, first Olympic Games to have an Olympic network of dedicated priority traffic lanes :

160km network of Olympic priority lanes for all accredited vehicles + express Olympic bus lines

Average Games bus speeds increased from 12-20 km/h to a 50-55 km/h..... at everybody surprise !...mostly by critical foreign media!

Road endemic congestion--one of the biggest worry in Athens-- was replaced by “fast convenient Games travel journeys”

Athens also developed more efficient bus services than Sydney focused and dedicated to each Olympic client-groups



Athens 2004 extensive transport project developments



Olympic Works Progress Report

TRANSPORT PROJECTS

TRAFFIC MANAGEMENT CENTRE

MEPPPW
Signature of Contract: 20.12.02
Completion date: 31.12.03
Works Progress: -

METRO LINE 1 STATION UPGRADES

ISAP
Signature of Contract: 30.07.03
Completion date: 30.06.04
Works Progress: 55% (30.09.03)

EASTERN BRANCH OF OLYMPIC RING ROAD, KISSIAS AVENUE, FAROS INTERCHANGE

MEPPPW EYDE/ESEA
Signature of Contract: 09.04.02
Completion date: 31.03.04
Works Progress: 50% (30.09.03)

METRO LINE 2 EXTENSION, SEPOLIA TO AG. ANTONIOS

MEPPPW - ATTIKO METRO
Signature of Contract: 26.08.01
Completion date: 30.06.04
Civil Works Progress: 50% (30.09.03)

ANDREAS PAPANDEUROU AV., LIPASMATA TO AGIOS NIKOLAOS BAY

MEPPPW EYDE/ESEA
Signature of Contract: 02.08.99
Completion date: 31.12.03
Works Progress: 56% (30.09.03)

WESTERN BRANCH OF OLYMPIC RING ROAD, KIFISOS AVENUE, ATHINON AV. - POSEIDONOS AVENUE

MEPPPW EYDE/ESEA
Signature of Contract: 01.02.99
Completion date: 15.07.04
Works Progress: Sections 1-4: 100%; 64%; 60%; 42% (30.09.03)

WESTERN BRANCH OF OLYMPIC RING ROAD, KIFISOS AV. - POSEIDONOS AV. INTERCHANGE

MEPPPW EYDE/ESEA
Signature of Contract: 03.01.02
Completion date: 30.04.04
Works Progress: 60% (30.09.03)

TRAM CONSTRUCTION, SYNTAGMA SQ. TO NEO FALIRO AND GLYFADA

MTC - TRAM S.A.
Signature of Contract: 10.12.01
Completion date: 10.03.04
Works Progress: 62% (30.09.03)

METRO LINE 2 EXTENSION, DAFNI TO ILLIOUPOLI

ATTIKO METRO
Signature of Contract: 16.01.02
Completion date: 31.03.04
Civil Works Progress: 90% (30.09.03)

OAKA ROAD PROJECTS

MEPPPW EYDE/ESEA
Signature of Contract: 18.12.01
Completion date: 31.03.04
Works Progress: 58% (30.09.03)

ROAD CONNECTION TO OLYMPIC VILLAGE

MEPPPW EYDE/ESEA
Signature of Contract: 13.11.01
Completion date: 30.03.04
Works Progress: 75% (30.09.03)

ATTIKI ODOS

MEPPPW EYDE/SERA
Signature of Contract: 23.05.96
Completion date: 31.03.04
Works Progress: 94% (30.09.03)

ROAD CONNECTION TO SCHINIAS ROWING CENTRE

MEPPPW EYDE/ESEA
Signature of Contract: 20.03.02
Completion date: 19.03.04
Works Progress: 56% (30.09.03)

MARATHON ROUTE, SECTION 1, MARATHON TO N. MAKRI

MEPPPW EYDE/ESEA
Signature of Contract: 07.12.01
Completion date: 31.12.03
Works Progress: 34% (30.09.03)

MARATHON ROUTE, SECTION 2, N. MAKRI TO PALLINI

MEPPPW EYDE/ESEA
Signature of Contract: 04.01.02
Completion date: 30.06.04
Works Progress: 44% (30.09.03)

METRO LINE 3 EXTENSION, ETHNIKI AMYNA TO STAVROS

MEPPPW - ATTIKO METRO
Signature of Contract: 10.08.01
Completion date: 31.05.04
Civil Works Progress: 88% (30.09.03)

STAVROS - PIKERM I AVENUE

MEPPPW EYDE/ESEA
Signature of Contract: 27.05.02
Completion date: 30.04.04
Works Progress: 51% (30.09.03)

SUBURBAN RAILWAY, SPATA - SKA

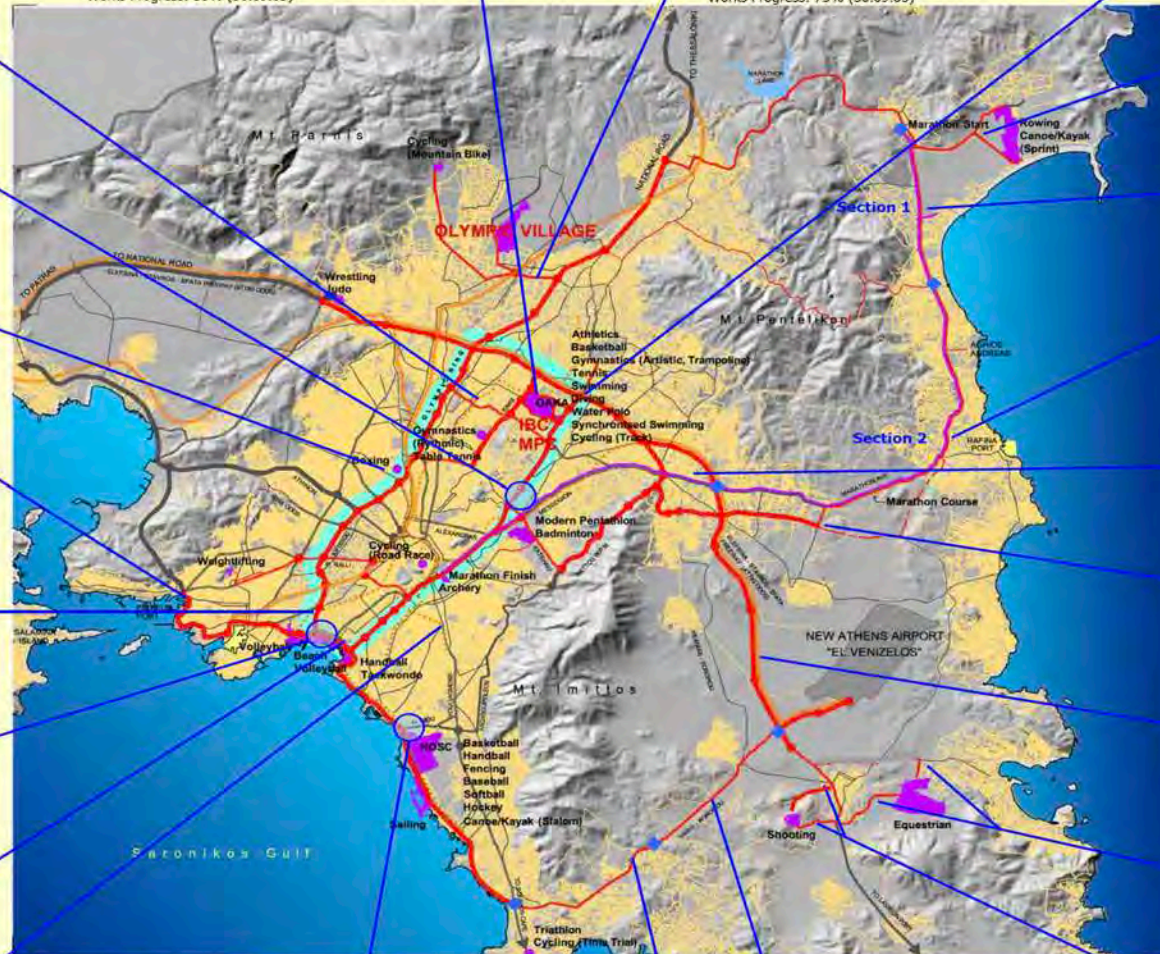
MTC - ERGOSE
Signature of Contract: 22.02.02
Completion date: 31.05.04
Works Progress: 85% (Earthworks) (30.09.03)
18% (E/M, Stations, Tracks) (30.09.03)

ROAD CONNECTIONS TO EQUESTRIAN CENTRE

MEPPPW EYDE/ESEA
Signature of Contract: 26.02.02
Completion date: 26.02.04
Works Progress: 82% (30.09.03)

ROAD CONNECTIONS TO SHOOTING CENTRE

MEPPPW EYDE/ESEA
Signature of Contract: 25.06.02
Completion date: 31.12.03
Works Progress: 24% (30.09.03)



POSEIDONOS AV., ALIMOU INTERCHANGE

MEPPPW EYDE/ESEA
Signature of Contract: 22.11.01
Completion date: 31.01.04
Works Progress: 39% (30.09.03)

VARI - KOROIPI AV., SECTION 1

MEPPPW EYDE/ESEA
Signature of Contract: 03.12.01
Completion date: 31.03.04
Works Progress: 46% (30.09.03)

VARI - KOROIPI AV., SECTION 2

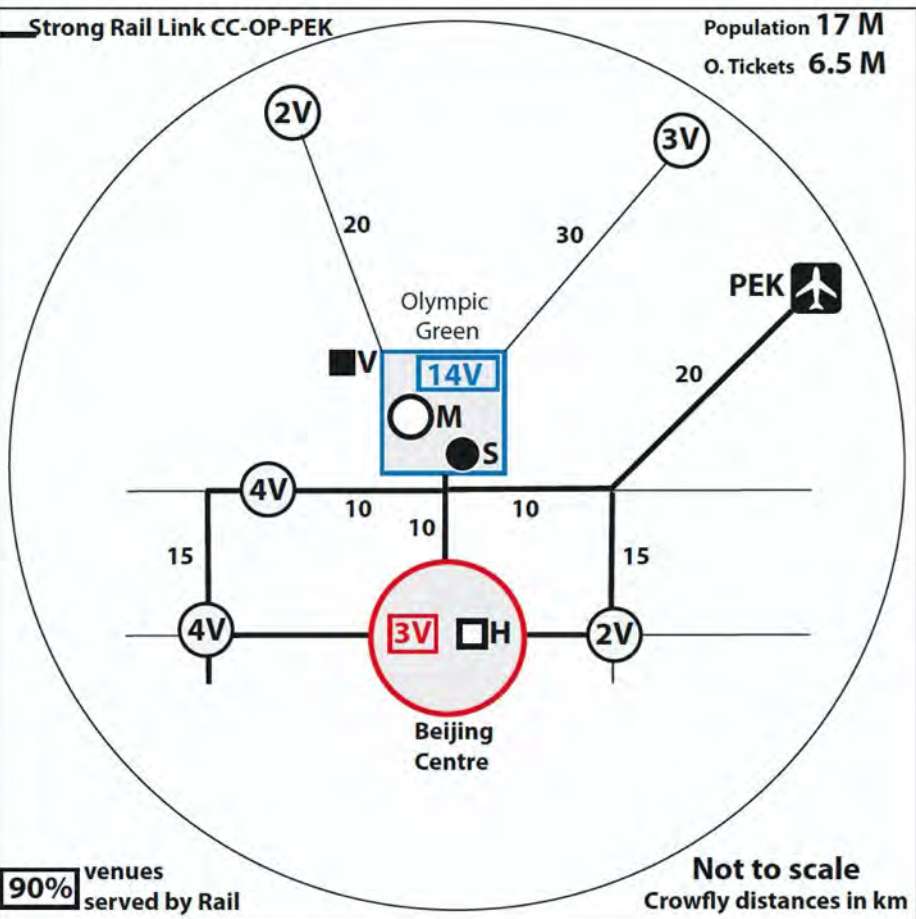
MEPPPW EYDE/ESEA
Signature of Contract: 10.09.02
Completion date: 01.06.04
Works Progress: 52% (30.09.03)

Beijing 2008



Beijing 2008 Games structural map

3 Schematic Games Concept BEIJING 2008



Population 17 Mio / Spect. 6.5 Mio

- **Very Strong 14 venue Olympic Park** with Olympic BirdNest Stadium 80'000, IBC+MPC and Olympic Village 10km North of Beijing CBD connected by 2 metro lines.
- **Beijing Centre second central Olympic hub** with 3 venues, Olympic hotels
- **Extensive 300 km Olympic lane system** providing efficient, fast, reliable, Olympic extended family mobility
- **Five new metro lines, new suburban railway to Airport, extensive motorway ring expansions** are long term transport legacies
- **Special bold traffic reduction measures (odd-even License plates) during 60 days improved transport and environment / see below)**

Beijing 2008 very fast growth challenges

China and Beijing huge 2000-2008 economic double digit growth rates generated one of the world fastest motorization growth-

*In Beijing Capital, population 17 million, about **half million new cars** every year since 2001 to 2008 Olympic Games*

***Almost total “disappearance” of bicycles** due to better public transport and extensive car motorization*

***Considerable increase of air pollution** due to fast vehicle growth, poor vehicle and truck environmental standards and many heavy pollution industries (many removed ahead of Games) and considerable amount of new construction and generated dust*

***Air pollution levels to exceed Olympic standards for high endurance competitions** like marathon, cycling, triathlon, etc.*

Beijing 2008 major transport developments

*Beijing 2008 invested > **20 billion US\$ to cleanup the metropolitan environment** + major vehicle fleet environmental upgrade especially Municipal bus fleet worst record (efforts without sufficient results), removal of huge polluting industries*

***Tripling Beijing Capital airport capacity** with new terminal 3 (largest in the world with 1 million sqm)*

***Tripling public transport system capacity** in seven years of Games preparation, 5 new subway line developments + Airport rail links (serving each terminal separately)*

***Doubling, already considerable motorway and expressway network** / Fifth Ring motorway (105km) and part of Sixth Ring (205km)*

Beijing chaotic traffic conditions 1 year before the 2008 Olympic Games



Directional traffic congestion and high entering flows prevented Olympic traffic to gain access to motorway median Olympic reserved lanes. Cutting traffic by 40% was the chosen solution

Beijing centrally controlled motorway Olympic dedicated priority lanes



Beijing 2008 massive 40% car traffic reduction also to fight air pollution (ann II)

*Very severe Beijing Summer air pollution (hot and very humid in August 2007) due to extremely rapid vehicular traffic growth and considerable construction work dust contributed to **very high levels of pollution threatening health***

August 2007, exactly 1 year before Games, 4 test days with 40% all vehicles “odd-even” traffic reduction

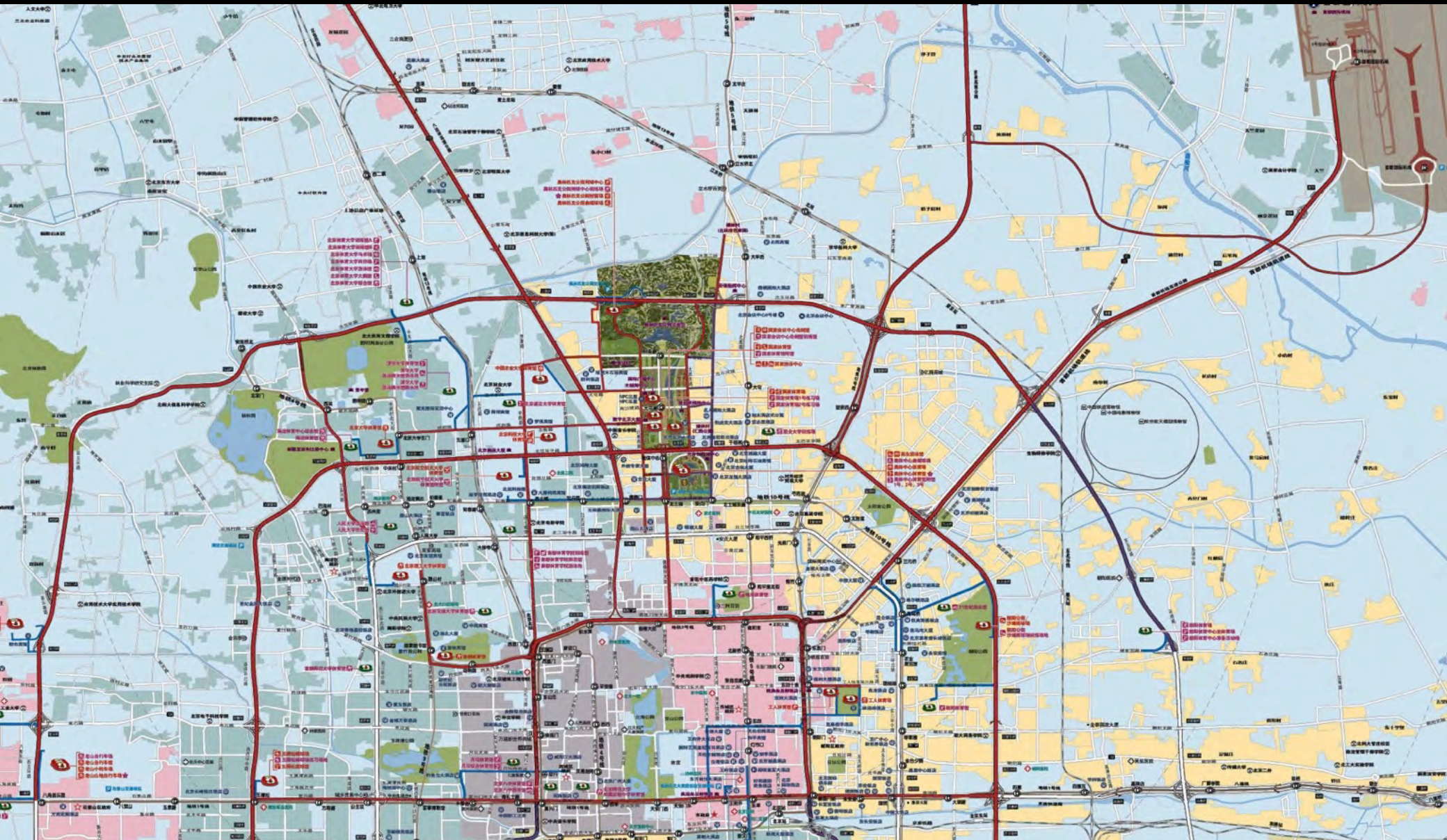
Olympic-lane system would have been ineffective without massive vehicular traffic reduction

For 2008 Games, odd-even (ALP) alternate license plates reduction of 35-40% of all registered motor vehicles during 60 days, put about 1,8 million vehicles “out of use” every day from a total of 3.5 million // In addition heavy polluting trucks and busses were banned

From Beijing 3 metro lines in 2001 to 8 lines for 2008 Olympics and 22 lines after 2016



Beijing 2008 venues interconnected by a 300 km network of dedicated Olympic lanes

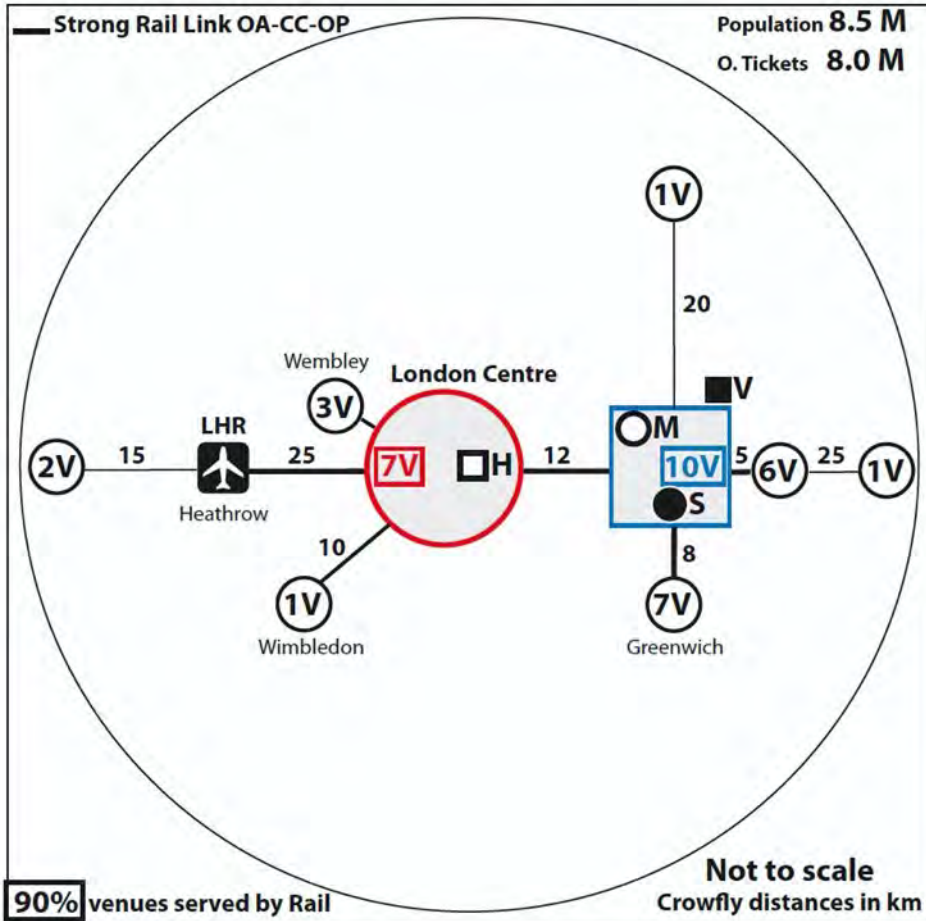


London 2012



London 2012 Games structural map

4 Schematic Games Concept LONDON 2012



Population 8.5 Mio / Spect. 8.0 Mio

- **Strong 10 venue Olympic Park** with Olympic Stadium 80'000, IBC+MPC and Olympic Village 12km East of London CBD
- **Next to Olympic Park 13 Venues** East and South
- **London Center third Olympic hub** with 7 venues, Olympic hotels and Media hosting
- **Olympic Lane about 130 km** of core/permanent lane system + time activated O.lanes providing efficient, fast, reliable, Olympic extended family mobility
- **Extensive high performance public transport developments:** DLR extensions, Jubilee line capacity upgrade, Javelin High speed and much improved Stratford international and national rail hubs—
- Tremendous long term quality transport legacies for London and East London in particular (see next slides)

London 2012 Games public transport concept

London 2012 Olympic Games concept:

- 1. Largest urban industrial waste land **rehabilitation program in Europe to create the heart of the Games : the Olympic Park of in East London***
- 2. **Massive “once in a century” rail transport improvement** program mostly centered on East London to substantially upgrade public transport services*
- 3. London Olympic venues optimally located to be accessed by **more than one Tube/rail station***
- 4. **Massive increase of Tube, Jubilee Line and DLR operations late at night***
- 5. **London 2012 =Most “public transport oriented Games concept”!***



Source: Olympic Delivery Authority. 2012 photograph looks South from Eton Manor. 2008 photograph

London 2012: transport strategies + legacy

Strategy

- **No spectator parking at venues**
- **Most London venues close to 2-3 Tube or DLR stations**
- **Maximised use of enhanced public transport for spectators, workforce, volunteers, visitors and Olympic accredited**
- *Well managed ORN - Olympic Route network*
- *Smart TDM - Traffic Demand Management to minimize traffic (without Alternate License Plate scheme-- keeping Congestion charge scheme)*

Vision

*Integrated approach between Games general transport, public transport, Games venue concept and City development // **Last mile venue accessibility concept***

Legacy + Sustainability

Legacy and sustainability fully integrated into all 2012 Games planning

Venue accessibility from tube/rail stations

Horse Guards Parade



- 7 Piccadilly Circus
Piccadilly Line/Bakerloo Line
- Charing Cross Northern Line
Bakerloo Line/National Rail

Wembley Stadium



- 11 Wembley Park
Metropolitan Line/Jubilee Line

Wimbledon



- 12 Wimbledon District Line/National Rail
- Southfields District Line

Royal Artillery Barracks



- 4 Woolwich Arsenal
DLR/National Rail

ExCel



- 3 Prince Regent DLR
- Charing Cross DLR

Earls Court



- 9 Earls Court
District Line/Piccadilly Line

Hyde Park



- 8 Hyde Park Corner
Piccadilly Line

Lord's Cricket Ground



- 10 St. John's Wood
Jubilee Line

Greenwich Park



- 6 Greenwich DLR/National Rail
- Cutty Sark DLR

North Greenwich Arena



- 5 North Greenwich
Jubilee Line

Olympic Park



- 1-2 Stratford Central Line
Jubilee Line/DLR/National Rail/
London Overground
- West Ham Jubilee Line
District Line/Hammersmith & City

Aquatics Centre



Basketball Arena



VeloPark



Hockey Centre



Eton Manor



Handball Arena



Olympic Stadium



Website
tfl.gov.uk

24 hour travel information
0843 222 1234

- Bakerloo
- Central
- Circle
- District
- Hammersmith & City
- Jubilee
- Metropolitan
- Northern
- Piccadilly
- Victoria
- Waterloo & City
- DLR
- Riverboat services
- London Overground
- London Underground under construction
- Blushlines: Station closed
- Interchange stations
- Step-free access from the platform to the street
- National Rail
- Riverboat services
- Tramlink
- Airport

Olympic Sports

Paralympic Sports

(What map date?)

London 2012 venues
The stations indicated are those nearest to the London 2012 venues, which can also be accessed by other stations.

For a large format version of this map see
london2012.com/publications
Background image: IFA © (2012) P

Efficient + flexible Olympic route network

*After 2005 bid victory. London 2012 organizers were under constant **media criticism: transport and traffic will never work properly for the 2012 Games.***

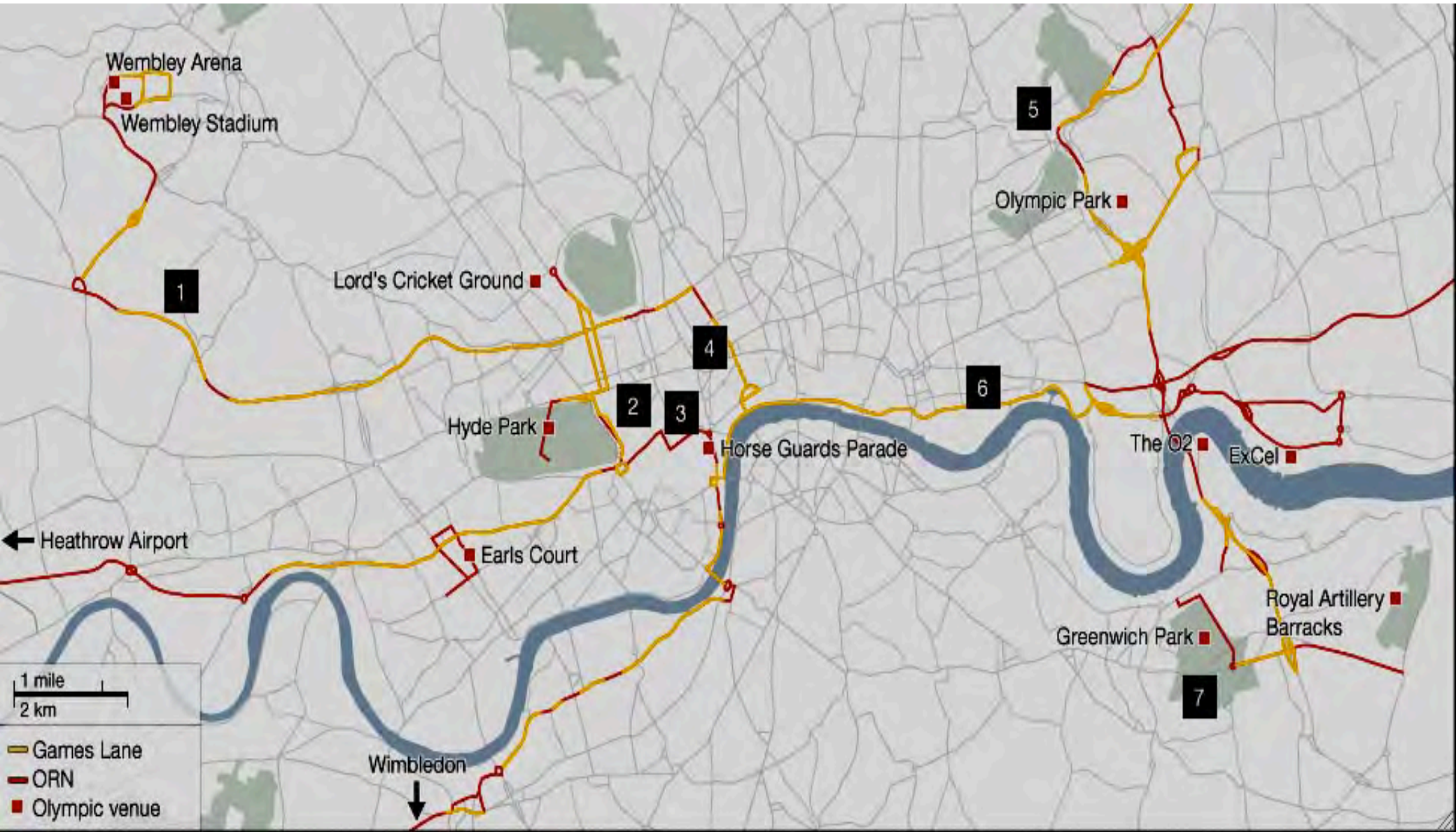
***The 200 km ORN - Olympic Route Network— was highly unpopular because felt as un-democratic** (undue advantage for VIP type users— Mayor Boris Johnson was against)*

After detailed studies, ORN was finally implemented with:

- ***A Games Olympic Lane permanent core of 80km** in City Centre*
- ***Flexible sections timely activated dependent on traffic loads***
- *sections without Olympic lanes but with Olympic route signage and best appropriate priorities*

Olympic Route Network & Olympic lanes

Yellow = Olympic priority Lanes // **Red** = Olympic signed routes



Olympic priority lane on London City street



Most successful public transport Olympic Games

London 2012 transport operations were much more successful than predicted by British media : enough capacity - flexible management - excellent communication and signage - transport helpful and convivial volunteers

The Underground operated at capacities up to 30% more than maximum ever recorded (DLR-Railroad was up 100%)

TDM (Travel Demand Management) achieved **reduction of road traffic demands of about 30%** in hotspots allowing the Olympic Route network (ORN) to work better than expected

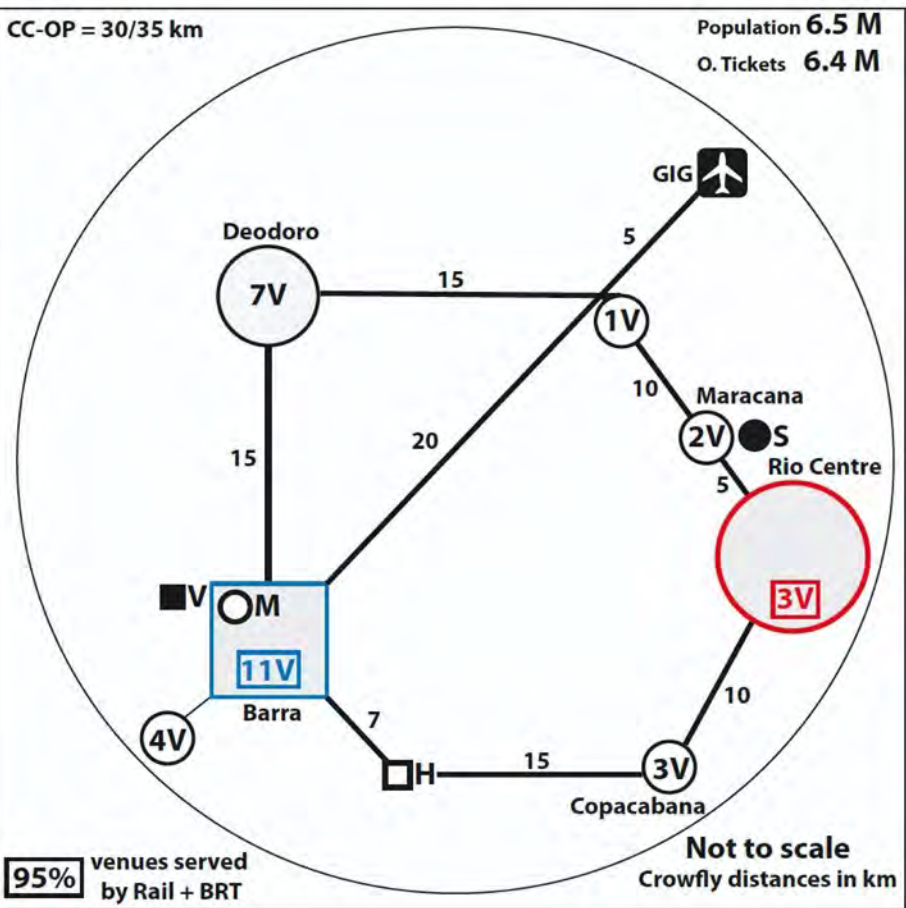
Significant **shift of Olympic accredited users** entitled to use dedicated Olympic transport **to more efficient and faster rail public transport**

RIO 2016



Rio 2016 Games structural map

5 Schematic Games Concept RIO 2016



CC - City Centre	V Olympic Village	Inside OP - Olympic Park
OP - Olympic Park	S Olympic Stadium	Inside CC - City Centre
OA - Olympic Airport	M Olympic Media C.	Outside OP and CC
H Olympic Hotel		

Approx. nb. competition venues

Population 6.5 mio / Spect. 6.4 mio

- **Strong 11 venue Olympic Park** with, IBC+MPC and Olympic Village nearby // 35km West of Rio CBD connected with new metro + 3 BRT lines
- **Deodoro second Olympic hub** with 7 Venues, 1 suburban rail and 1 BRT line connected to Olympic Park
- **City Center** with 3 venues and most attractive harbour area live site
- **Olympic lane system**—230km— providing Rio long travel distances efficient, fast, reliable Olympic extended family transport
- **Very extensive high performance public transport developments:** new metro line, suburban rail rehabilitation, 3 new BRT lines and new tramway
- **long term quality transport legacies to serve all four Rio urban and traffic zones** (see next slides)

RIO 2016 to solve crucial transport problems

- 1. To overcome Rio chaotic road traffic and public transport situation, Rio bid promised a much extended and upgraded public transport system***
- 2. Rio had only a very small metro (40km) for a City of 6 million. Located in Western Rio, Rio Olympic Park was not properly connected to Rio Centre, South Zone hotel and touristic areas. Linkage was provided by new metro line 4 and BRT.*
- 3. Investments of 10 billion US\$ (twice the bid amount) have been made to develop HPPTR -- High Performance Public Transport Ring interconnecting all four Rio Olympic zones***
- 4. Rio 2016 Games were an outstanding catalyst to make a 25 year forward jump of high performance public transport in 6-7years (2010-2016)***
- 5. To overcome Rio worst world traffic congestion, Rio bid promised to cut background general traffic by about 25% through an “Alternate license plate scheme” (like Beijing 2008 or Sao Paulo-Brasil)*
- 6. This key measure was not implemented resulting in severe traffic difficulties throughout the Games and impairing OLN operations*

Rio Public transport infrastructure developments

Four Olympic zones:

- *Maracana / Rio Centre –*
- *Copacabana –*
- *Barra –*
- *Deodoro* interconnected *by a high performance public transport system aligned with Rio master development Plan*

Public transport construction/rehabilitation program:

- ***METRO**, line 4 Ipanema General Osorio – Barra Jardim Oceanico extension*
- ***SURBURBAN RAIL**, Deodoro suburban rail line extensively capacity and safety upgraded, with 6-7 new and rehabilitated stations serving major Olympic venues (like Maracana and Olympic Stadium) and surroundings*
- ***BRT (Bus Rapid Transit)** new 125/150km high performance express bus system (world largest such new system) with International Airport linkage to first Brazilian Airport served by Public transport*

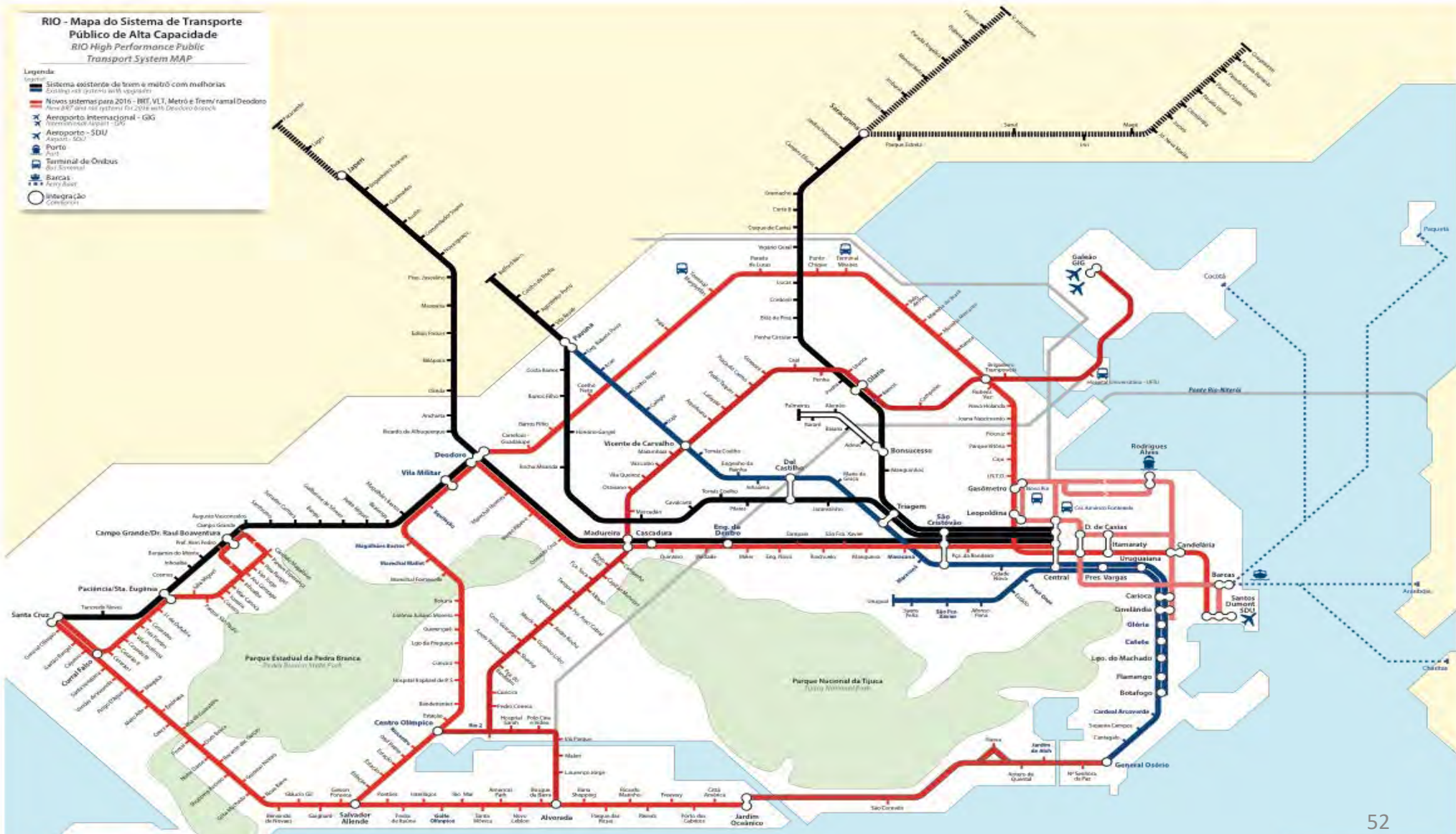
Public transport infrastructure developments

- **LRT**, Light rail tramway, one new line system serving Rio harbour +City Centre + SDU City Centre Airport
- **GIG**, Rio Gateway International Airport capacity extensions

Share of public transport clients using “high performance, faster, safer and better quality” public transport (mostly Rail and BRT— see MAP)

- **doubled between 2011 and 2016 (16% to 33%)**
- Extraordinary 6-7 year accomplishment and an **immediate better mobility legacy for 2.3 to 3.0 million DAILY Rio public transport journeys**
- **See map below: New public transport capacity developments in RED**

RIO considerable public transport legacy system 2010-2017 development = **shown in RED**



BRT - Bus Rapid Transit – High capacity bus systems
RIO BRT one of the largest such system (4 lines) in the world controlled
by a unique Central Command and Control Centre



Rio integrated command centre for all-transport, global surveillance and traffic emergencies integrating weather



CENTRO DE OPERAÇÕES PREFEITURA DO RIO



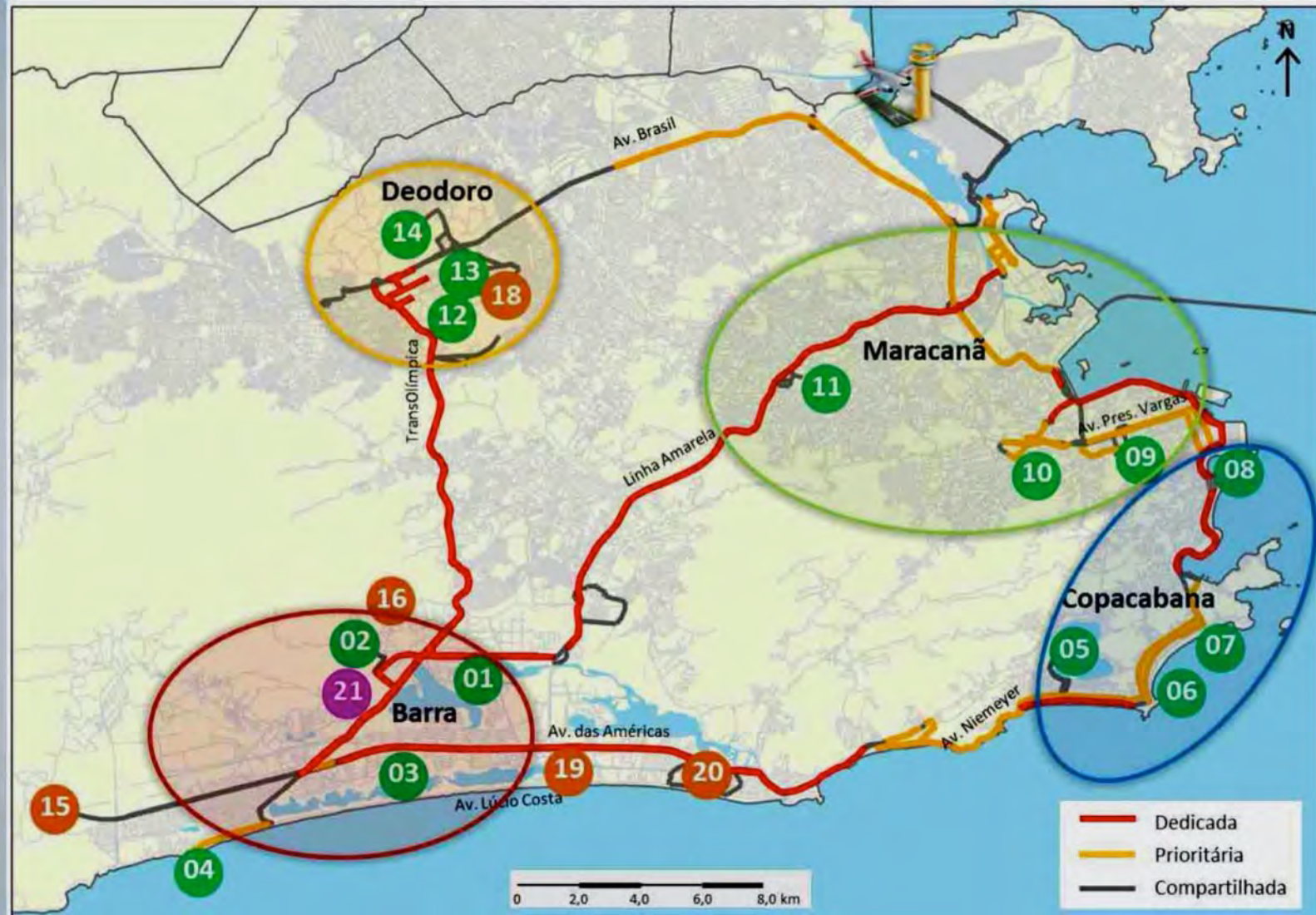
RIO 2016 OLN-- Olympic Lane Network

- ***Due to long distances between Olympic Zones*** located around large Tijuca National Park (105km²= surface of Paris), a ***300km system of Olympic Lanes was proposed in 2009 Rio Bid***
- ***230 Km of Olympic lane loop network*** connecting all Olympic Zones ***was delivered*** with two types of Olympic lanes:
 - ***160km of fully dedicated Olympic Lanes*** (24h/24h—all Games)
 - ***70km of “priority” lanes*** where Olympic priority traffic was mixed with local general traffic (see map below)
- ***Good system but temporary partial failures*** due to ***discontinuities between fully dedicated and less protected “priority lanes”***

RIO 2016 OLN Olympic Lane Network

Rede de Faixas Olímpicas – tipos de faixas

Instalações	
01	Parque Olímpico
02	Rio Centro
03	Golfe
04	Pontal
05	Lagoa
06	Forte de Copacabana
07	Vôlei de praia
08	Marina da Glória
09	Sambódromo
10	Maracanã
11	Estádio Olímpico
12	Centro Equestre
13	Deodoro Center
14	Parque Radical
15	Vilas de Acomodação 1 e 2
16	Vila de Acomodação 3
18	Vila de Acomodação 5
19	Hotel Oficial
20	Hotel Oficial Principal
21	Vila dos Atletas



Rio 2016 -Transport and Mobility global positive assessment

Thanks to Olympic catalyst impact, it took Rio only 6-7 years to make a 25-30 year public transport progress towards better urban mobility for Rio users of almost all areas of Rio:

- Rio delivered 50% more new or rehabilitated high performance public transport systems than announced in the 2009 bid. This allowed a doubling of public transport clients (from 16% to 33%) being able to move around Rio with much better, faster and safer public transport systems.*
- Rio high performance public transport clients has increased 33% of all public transport movements, a tremendous achievement not observed in any previous Olympic Games Cities*
- For the first time in RIO history, a fully integrated RIO public transport map putting together Metro+ Suburban trains+ BRT new network + Light Rail + Ferries was produced (like for London or Paris and other great world Cities!)*

TOKYO 2020



新国立競技場 (オリンピックスタジアム)

- Olympic Stadium
- 開会式・閉会式 (Opening and Closing Ceremonies)
 - 陸上競技 (Athletics)
 - サッカー (Football)
 - パラ陸上競技 (Para-athletics)

日本武道館

- Nippon Budokan
- 柔道 (Judo)
 - 空手 (Karate)

東京国際フォーラム

- Tokyo International Forum
- フェイトリフティング (Weightlifting)
 - ボウアーリフティング (Bowling)

Tokyo Metropolitan Government

Shinjuku Sta.

Yoyogi Park

Shinjuku Gyoen National Garden

Tokyo Tower

The Imperial Palace

Tokyo Sta.

Shibuya Sta.

Shinagawa Sta.

選手村 (Athletes' Village)

Rainbow Bridge

Hamanikyū Gardens

潮風公園

- Shikokaze Park
- ビーチバレーボール (Beach Volleyball)

お台場海浜公園

- Odaiba Marine Park
- トライアスロン (Triathlon)
 - 水泳 (マラソンスイミング) (Aquatics (Marathon Swimming))

青海アーバンスポーツ会場

- Aomi Urban Sports Venue
- スケートボード (Skateboarding)
 - スポーツクライミング (Sport Climbing)
 - 5人制サッカー (Football (Futsal))

大井 Hockey 競技場

- Seaside Park Hockey Stadium
- ホッケー (Hockey)

有明テニスの森

- Ariake Tennis Park
- テニス (Tennis)
 - 車いすテニス (Wheelchair Tennis)

有明 BMX コース

- Olympic BMX Course
- 自転車競技 (BMXレーシング) (Cycling (BMX Racing))

有明アリーナ

- Ariake Arena
- バレーボール (バレーボール) (Volleyball (Volleyball))
 - 柔いすバスケボール (Wheelchair Basketball)

有明体操競技場

- Olympic Gymnastic Centre
- 体操 (Gymnastics)
 - ボッチャ (Boccia)

オリンピックアクアティクスセンター

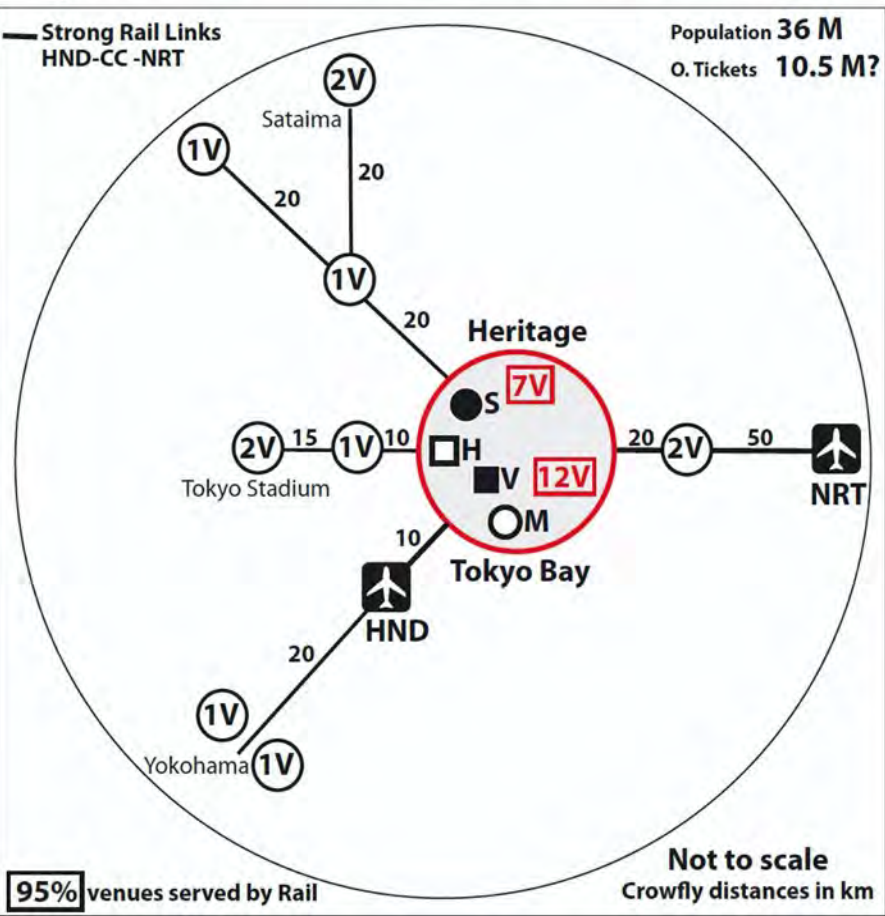
- Olympic Aquatics Centre
- 水泳 (競泳、水球、シンクロノイズスイミング) (Aquatics (Swimming, Water Polo, Synchronized Swimming))
 - バレーボール (Volleyball)

東京辰巳国際水泳場

- Tokyo International Swimming Pool
- 水泳 (競泳) (Aquatics (Swimming))

Tokyo 2020 Games structural map

6 Schematic Games Concept TOKYO 2020



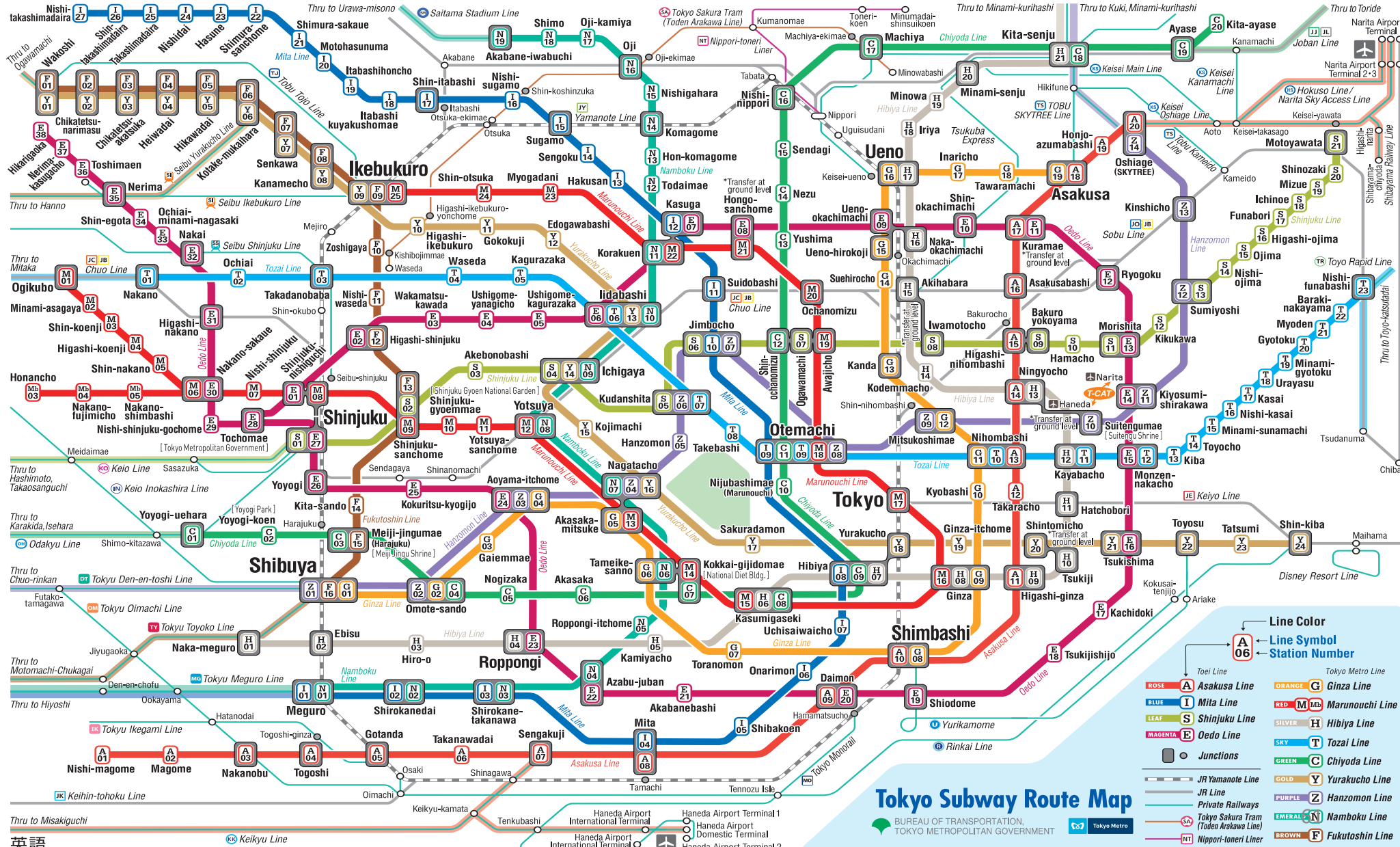
Greater Tokyo 36 mio/ Spect. 8.5 mio

- **Games without Olympic Park.**
- **But City Centre Heritage and Tokyo Bay zones concentration** of 19 venues, Olympic Village, Olympic Stadium, Media Centre and Olympic Hotels, where rail and expressway traffic conditions are most critical
- **Games venues 55% in Centre** and 45% outlying, generally >30km
- **Most powerful and efficient rail system in the world** carrying 24 mio Pax per weekday but saturated during heavy peak periods
- **City Centre narrow 4-lane** / without shoulders toll Metropolitan Expressway system with traffic high peaking congestion
- **First Olympics without OLN (Olympic Lane Network)** replaced by ORN (Olympic Route Network) -without Olympic specific priority system but special ad hoc traffic management

Tokyo 2020 searching for more sustainable public transport mobility (ann III)

- **Tokyo rail system, most heaviest traffic with 24 mio pax/weekday** and most efficiently operated in the world has tough challenges to cope with supplemental Olympic travel demands of 2.0 to 3.5 million additional PT trips per day
- **Traffic –mainly commuter traffic– reduction strategies are being planned,** developed and tested (July 2019) by Government, major industries to reach **PT mobility reductions of 10% average and 25% in critical areas of central Tokyo**
- **Technics considered :** telework, vacations incentives, work period changes, activity re-scheduling (shifting business and operations at night) etc.
- **Climate change** might be a major problem for the Olympics, in late October 2019, decision was taken to move some critical endurance sports such as the marathon and others from Tokyo to much cooler climate of Sapporo in North-Eastern Japan
- **Beyond the Olympics, Tokyo Government is planning for long term sustainable mobility solutions to be implemented**

Tokyo Subway map-- without most JR Rail lines!



Tokyo Subway Route Map

BUREAU OF TRANSPORTATION, TOKYO METROPOLITAN GOVERNMENT
 Tokyo Metro

英語

4. *Mega-events and more sustainable mobilities*

- ***Obtaining Summer Olympics is a world competition.*** Candidate bidding Cities (\pm strongly backed by their country) play their best cards. ***To hope being successful :***
 - ***N°1 card is an Olympic efficient and attractive sport concept.***
 - ***N°2 card is a top transportation and mobility scheme : a tremendous challenge to host the biggest mega-event in the world***
- ***Public transport is the N°1 issue*** given the extraordinary strong time/space concentrated travel demands for reliable on-time stable and secured performances.
- ***All 5 Olympic Cities 2000 to 2016, accelerated bold and massive high performance public transport projects catalized by the Olympic bid dynamics (except Tokyo 2020 where the Rail system was already considered fully developed).*** Details provided in Annex I,II,III.

Catalysts for more PT sustainable mobility

- *Extraordinary high public transport market expansion* during mega-events due to temporary special measures such “*no parking*” within half/mile, half/km of Stadium, Arenas, sport complex, etc.
- *Public transport is boosted by 24h free PT transport for Olympics* or other mega-event (transport of ticketed spectators is part of the event happening)
- *Extensive development of high performance quality public transport* trigger immediate and short term PT oriented housing, accommodations , hotels, commercial, business and activity sectors near new PT stations
- World mega-events with a *compulsory fixed date special transport Plan and special robust mobility management scheme, serve as laboratories for more sustainable mobility scheme developments*
- As shown in following chap 5, IOC reactions to multiple critics focused on “*the Games are becoming too big*”, lead to drastic reassessments of future Olympic development orientations *called Games Management 2020 New Norm*
- In the transport and mobility planning domains, tremendous progress have been made during the last 10-15 years to *simulate more sustainable metropolitan activity and mobility development policies through advanced digitalization*

5. IOC New Norm and Olympics 4.0

(GM2020 = Games management 2020—New Norm)

Summer Olympic Games may have reached their limits due to at least six critical aspects:

- 1. Games becoming too big** to be sustainable
- 2. Pharaonic growing costs**—out of reach for most potential Host Cities
- 3. Transport and mobility** unbearable pressure on Host City
- 4. Considerable impacts** – in many domains: environment, energy, climate change
- 5. Often unproven legacies** –lack of proven sustainable legacies in many areas // still much too many “white elephants”
- 6. Increasingly difficult political acceptability** typified by:
 - growing citizen opposition to the Games (see map below —**red Cities**)
 - 15- 20 year decline in Summer and Winter Games bids

Olympics less political support and acceptability

Referendum against Olympic bids in democratic countries

- **In red referendum defeat (Almaty formally blue turned red and formally gold Sion 2026 also Red)**
- **In blue successful recent Olympic bid of new Milano-Cortina 2026 (minus Blue Almaty 2022 and gold Sion 2026)**

Background

It has become difficult to convince citizens



New Norm objective N°1

Adapt the Games to Host Cities and not the reverse

Of the six most critical aspects listed above, all of them finally converge on the question of unsustainable impacts of “imposed format” too big Games on the potential bidding City

*That is the reason why the Games management 2020 New Norm **most fundamental future Games change is one of paradigm:***

- **Instead of transforming Cities for the Games , the new approach is to:***
- **Adapt the Games to Host Cities strategic development orientations***


New Norm objective N°2

Summer and Winter Games cost saving ambitions

*IOC answer to Games size + cost crisis = Rethink Olympic concept and management parameters **to substantially reduce the OCOG Summer Games cost by minus 1 billion and half a billion for Winter Games***

Ambition **Overall Ambition for Cost Savings**

Check and Control Property
Check "Local" before downloading or
posting it up



- USD 500 mn

for Olympic and Paralympic
Winter Games OCOGs



- USD 1 bn

for Olympic and Paralympic
Games OCOGs



- Balanced OCOG Budgets without public subsidies
- Simplified Games delivery
- More cities to consider future Olympic bids

Games bidding and 7 year preparation digitalization

The search for effective responses to most of GM2020 six main challenges :

1. *Maintain (at least not increase) Games overall size*
2. *Decrease non-legacy infrastructure costs and Games operational costs by 20%*
3. *Optimise transport efficiency and induce more sustainable mobilities*
4. *Reduce environmental impacts integrating climate change*
5. *Systematical search for legacies and sustainability--eliminate white elephants*
6. *Improve political and citizens acceptability*

might be fundamentally helped by “digitalization” of the Games:

- **2 years bidding process** *new negociative process between IOC and candidate City for common optimum solution searching*
- **7 years of Games plan optimization** *leading to effective Games final delivery.*

Games digitalization will be a decisive contribution to the N°1 paramount objective of GM 2020 New Norm:

- **Adapt the Games to Host Cities strategic development orientations**

Digitalization of four Games foundation domains

1. Digitalization of Olympic venue concept or master plans ("x" options)

- **Venues spatial locations** in relation to existing transport systems / for what sport(s)? / what size? / what net operative capacity ?

2. Digitalization of the Olympic sport program and venue client travel demands ("y" options)

- **Olympic day by day program for each venue / each sport/ Nb. sessions per day**
- **Public transport and road travel demands generated by the Games program :** daily and hourly requirements for each clients groups: Athletes, Medias, Olympic officials and logistics, Spectators, Workforce and Volunteers, Security. Medical, etc

3. Digitalization of existing transport system and proposed Games-time

- **Existing transport system performance and capacities without Games**
- **Expanded transport system as proposed by Host City** in relation to the Olympic venue concept and other transport development strategies (**"z" options**)

Multiple digitalization options to compare....

4. Digitalization of venue concept and Olympic program with City transport + mobility management Games performance allow comparisons of:

- Olympic venue master plans options “X1-X2-X3”
- Games sport programs options “Y1-Y2”
- Transport system 7 year improvement programs options “Z1-Z2” with
- Games mobility management policies options “Z3+Z4”

5. These comparative elements are major knowledge resources for the IOC and bidding City two year search of the most optimal common Games solution

6. After Games’win, a seven year preparation of Games delivery is necessary to review and optimize all Games operations.

Often done by new local Authorities and new Organizing technical staff, most Games planning is re-initiated “at almost zero level” and bidding knowledge investments are lost.

The bidding comprehensive digitalization knowledge stream shall be kept as the spinal cord of Games preparation optimisation effectiveness, Games impact in-house follow-up and sustainable + legacy development initiatives as well as constant cost monitoring.



Prof. Philippe Bovy
Olympic mega-event transport expert

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ANNEXES

Since Sydney 2000 Olympics are catalysts for more sustainable mobilities Towards Olympics 4.0

Ann I : Sydney 2000 to Athens 2004

Ann II : Beijing 2008 to London 2012

Ann III : Rio 2016 to Tokyo 2020

Ann IV : New Norm better mobility expectations

Ann I: Sydney+ Athens Transport and Mobility evolutions

- ***Sydney 2000 infra***—Rather limited new Rail PT (public transport) infra for Games
 - ***Sydney 2000 operational innovations***-- “no parking < 800m venue concept” and “24h free public transport integral part of Olympic ticket” made Sydneysiders temporarily change habits from 90% car mobility to 90% by Rail transport
 - ***Sydney post Olympic transport impact***-- triggered much of current PT developments-3 new light rail projects, tripling Sydney metro network (biggest current PT project in Australia)
-

- ***Athens 2004 infra***— 2004 Olympics were a huge 6 year catalyst of 25 years jump in Athens metro + suburban rail + light rail developments and new airport and its rail connexions (see map)
- ***Athens 2004 operational innovations***- Same as Sydney by transfer // Plus most efficient well enforced 150km Olympic Lane network // Much better Olympic bus fleet management than Sydney by targeted client groups
- ***Athens post Olympic new transport*** - Almost none due to political/economic crisis

Ann II: Beijing+ London transport and mobility evolutions

- ***Beijing 2008 infra***— 2008 Olympics were a huge 6 year catalyst of multiple new metro lines + rail to Airport developments + 2 major external Ring motorways completion
 - ***Beijing test 2017 test event***-- One year prior to Games, extensive innovative traffic test event of 15km pilot Olympic lanes between Tiananmen and Workers Stadium and 4 days of “odd-even Alternate License Plate scheme) by the Beijing Police
 - ***Beijing 2008 operational innovations***-- most efficient well enforced 300km full median motorway Olympic Lane network // 60 day Olympic and Paralympic Games “Odd + Even Alternate License Plate” traffic reduction scheme to very substantially decrease traffic and air pollution
 - ***Beijing post Olympic transport impact***- Continuous massive transport developments of metro from 8 to 22 lines, new Daxing Airport
-

- ***London 2012 infra developments*** – *See London 2012 section above*

Ann III: Rio + Tokyo transport and mobility evolutions

- ***Rio 2016 infra+ operations*** – See Rio section above
 - ***Rio post Olympic new transport*** - Almost none due to political/economic crisis
-

- ***Tokyo 2020 infra***– Almost no major new rail or new expressway infrastructures, Greater Tokyo enjoying one of the most powerful rail system in the world
- ***Tokyo 2020 operational innovations- No OLN- Olympic Lane Network*** (replaced by ORN-Olympic Route Network) without any priority replaced by ad hoc TDM+TSM+ Road pricing schemes still under development as of Fall 2019
- ***Tokyo 2019 test event*** One year prior to Games, one-week innovative traffic test event of road and rail specific TDM-Travel Demand Management schemes aimed at reducing traffic volumes in targeted areas of Tokyo where Olympic supplemental traffic will be concentrated
- ***Tokyo post Olympic transport impact-*** Tokyo Government to use and improve specific TDM traffic reduction schemes developed for the 2020 Games as support for more sustainable medium term mobility policies both for Expressways and roads and for rail Public Transport

Ann IV: new Norm better mobility expectations

- ***IOC Games Management 2020 New Norm was approved and initiated in February 2018—No concrete experience yet!***
- ***New Norm focuses on systematic transport services optimization for all Olympic Family client-groups—decentralization of services to sharply decrease distances and lower travel times—systematic pooling and sharing services to reduce costs***
- ***Very substantial progress have been made over 20 years for medium to long distance improved Olympic Games mobilities***
- ***Ironically, a particular difficult to manage problem is Last Kilometer comprehensive accessibility to Olympic Venues in terms of:***
 - ***Pedestrian flow quality management /crowd control***
 - ***Security + safety / airport control systems / all vehicular screening***
 - ***Low mobility clients improved travel access conditions***
 - ***Olympic standard + interactive signage and information systems***
 - ***City image, environmental quality and global conviviality***

-----***ETHZ-IVT Seminar : Big events as catalysts--Nov 5. 2019***-----