



ERASMUS Intensive Programme 2013: Spatial planning and sustainable urban transport systems

How to serve the future neighbourhood of Courelières in Joué-lès-Tours ?



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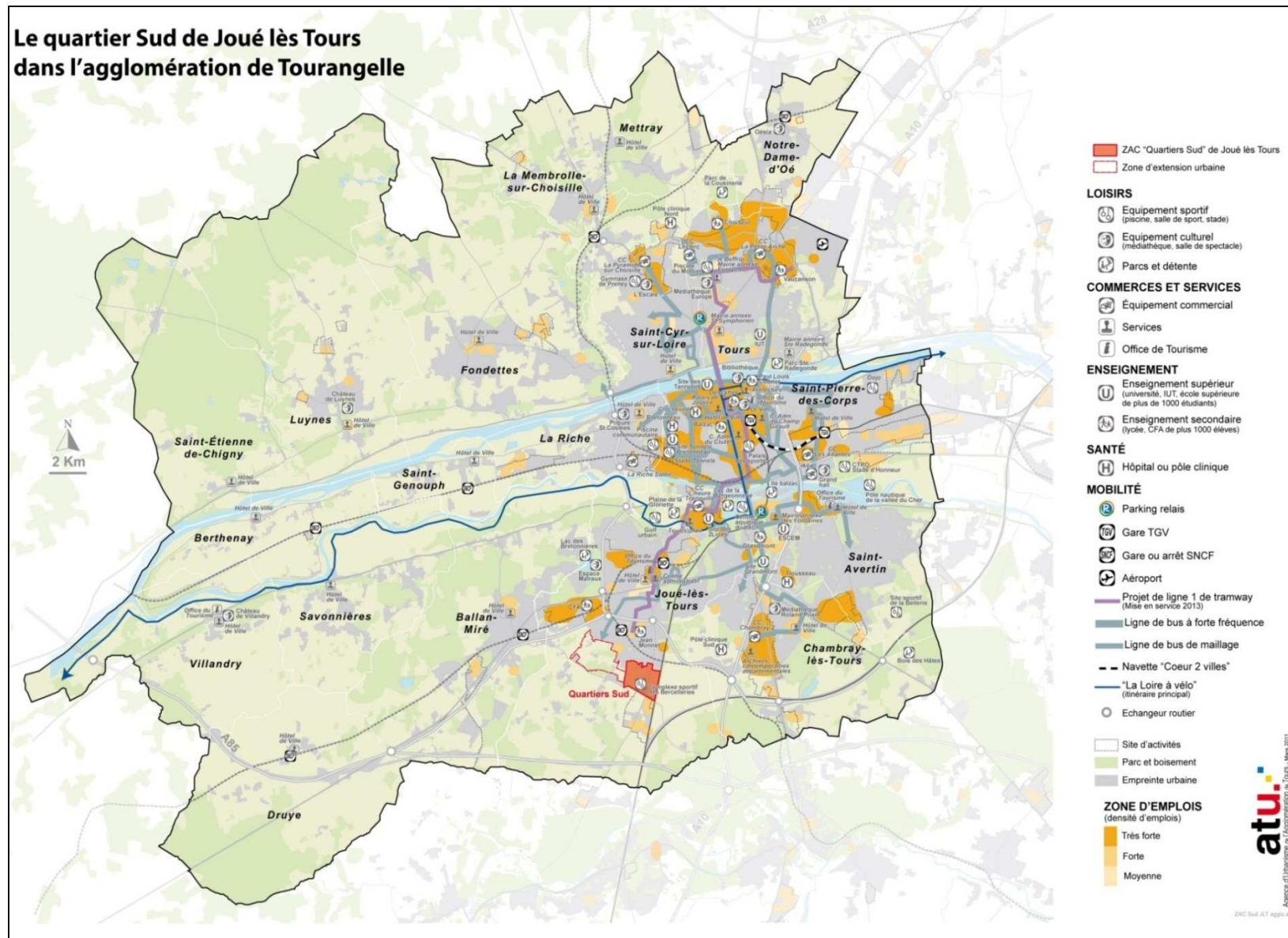
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Summary

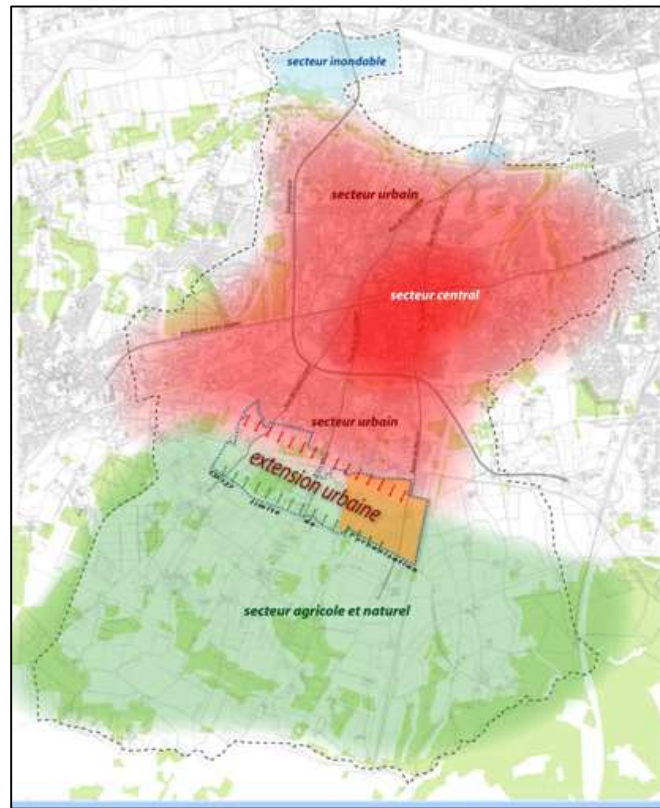
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I) Introduction

We are six French students finishing our last year at Polytech'Tours, an engineering school of urbanism and spatial planning. The end of our program consists in particular in a five weeks workshop which deals with the transport service of the future neighborhood of Les Courelières, situated in the south of Joué-Lès-Tours. This city has more than 37 000 inhabitants; it is the second most important municipality in the department of Indre-et-Loire and of the Tour-Plus urban area. It is situated in a very strategic location between the Loire and Cher rivers in the near south of Tours, prefecture of the department.



The site to be urbanized is the property of the Joué-lès-Tours municipality, and is isolated from facilities, shops and services situated downtown. The chosen area is about 150 ha and is localized on the border between an urban zone in the North and a rural one in the South.



Source: ATU

This sustainable neighborhood project is planned in three phases the first of which, in the East of the area, concerns 1200 apartments and houses to be constructed in ten years. Eventually, 3000 pieces of housing will be built (among which 30% of social housing). District facilities (early childhood center, care for elderly and disabled people, parks etc.) and some tertiary activities shall be integrated.



Ground-plan of the future first part of Les Courelières' quarter.

Source: Ville de Joué-Lès-Tours

The project was meant to set up a structural main axis crossing the “ZAC” from East to West, connecting the Ballan-Miré railway station to Villandry in Chambray. A specific public transport site was chosen to serve this line.

To be able to foresee the integration of the concerned area within its environment and to align it with existing networks, we decided to delineate a study area. Our goal was to connect Les Courelières to the most appealing places and dynamic zones of the region. We realized soon that our study wasn't only about connecting a district and the rest of a city; we needed to adopt a wider scale and point of view. From this point on we decided to realize a large diagnosis about the city, and then we targeted a more relevant territory, which was a big part of the conglomeration.

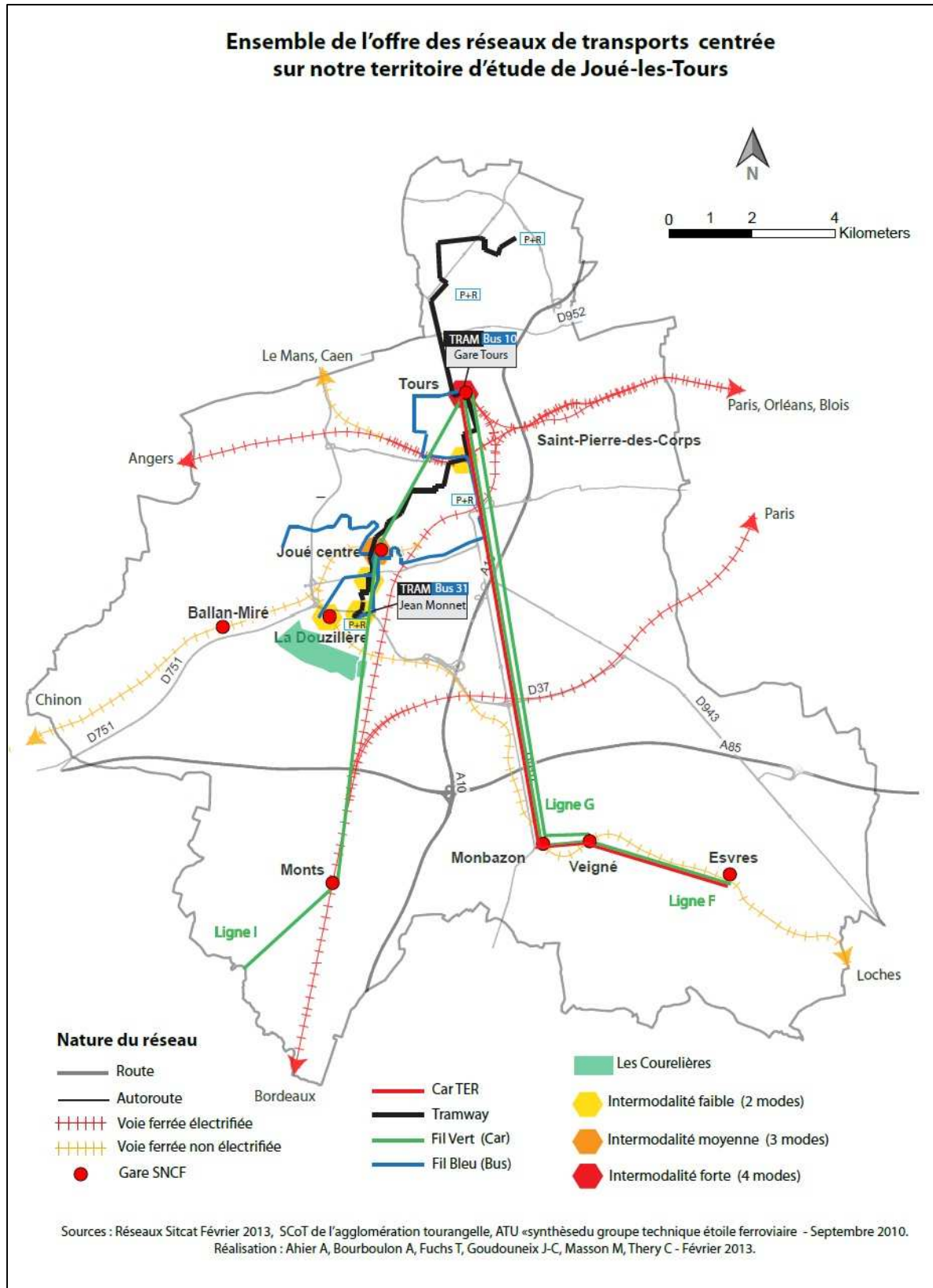
With the aim of choosing our study territory, we set as a reference an analysis of flows of home-work, between areas, extracted from the SCOT of Tours. This analysis highlights a metropolitan heart grouping together housing and working areas. We noticed a weak transverse connection between the various sectors of the metropolitan heart periphery (North, South, North-West and South-West of the territory of the SCOT). The majority of the flows of these zones turn to this central zone. So we chose to focus our studies on this major pole, and we added to it three municipalities because of railroad potentiality: Esvres, Montbazou and Veigné. Those potentialities will be illustrated afterwards.

Then we divided our work into two axes: the territory diagnosis and proposals of scenario. The diagnosis allowed us to analyse the supply and demand and to identify the weaknesses and key points of the transport network. As soon as the territory and its issues had been dealt with we started making proposals.

II) Diagnosis of the territory

1) Supply analysis

We noticed there are many and varied transport infrastructures in our study area.



a) Road networks

The conglomeration of Tours is served by a road network composed by a highway, a ring road and county and municipal roads.

Heavy traffic on this network causes some congestion particularly at the southern section of D37, D751 and D943, with a number of users per day up to 45 373 on the most used sections. On the highway, there are approximately 80,000 cars at the peak, in Tours Center.

In Joué-Lès-Tours, car traffic represents an important part of travel. In fact sometimes it reaches more than 90% on some destinations (neighbouring municipalities). The aim of the municipality is to reduce this percentage throughout the district, and particularly in the future quarter.

b) Fil Bleu Bus

Fil Bleu is Tours' transport company, it manages urban bus transportation. The bus network is composed of 26 regular bus lines, exploited from Monday to Saturday, from 5h30 to 21h00, the frequency varies according to the line. There are also 4 night lines (until 1 am) and 11 school lines. The service is lightened on Sunday and during holidays. In fact, only two lines run in town on these days.

We took an inventory of two bus lines which are located close to the future eco area of Joué-Lès-Tours:

- line 10 starts a few meters from Douzillère stop, crosses Joué-Lès-Tours downtown. It then goes up to the town of Tours, and has its terminus at Tours station;
- line 31 starts at Jean Monnet college in the city of Joué-Lès-Tours, and then goes up to the center to serve the west of the city.

c) Fil Vert bus

Fil Vert is the interurban bus transportation network of the department Indre-et-Loire. This network is composed of 27 lines. Currently, there is only one line which crosses the eco area. This line connects the city of Thilouze to Tours and has only one stop in Joué-Lès-Tours at the railway station "Joué centre".

d) The future tramway line

The tram system of Tours is a project of public transport in reserved lanes. Because of the increasing saturation of the Fil Bleu network, it was anticipated to build a tramline, which will use as much as possible the existing reserved lanes. This plan also permits the reorganization of the bus network.

Open to travellers from the 31 August 2013, the first line will globally follow the route of the current line one.

The project's completion was entrusted to CitéTram which groups together Equipment Company of Touraine (SET) and the company Transamo.

Seven tram stations will be implanted in Joué-Lès-Tours. The tram terminus in the city is located at Jean Monnet College. The distance between the terminus and the future eco-area south of Joué-Lès-Tours is approximately 1 km.

e) The railway line TER

Tours has an exceptional rail network organized like a star composed of nine branches (counting LGV Paris-Tours). We should exploit it to the maximum to create continuity with the system set up in our study area.

Considered on the perimeter, there are nine stops and railway stations: Tours, Saint-Pierre-des-Corps, Joue-les-Tours Centre, The Douzillère, Ballan-Mire, Monts, Montbazou Veigné and Esvres.

In our study, we are interested in three branches: [week values used are those of 2009]

- The southern branch from Bordeaux on which circulate notably TGVs connecting Paris to Bordeaux. On this route, we will consider the station Monts which presents 2080 departing and arriving per week, making it the busiest station if we exclude Tours and Saint-Pierre-des-Corps stations. The important number of users of this station leads to a saturation of car parks. On this line, we can find a company with more than 700 employees: the Commissariat à l'Energie Atomique and Alternative Energies (CEA), close to the station. This company causes flows, against the current of the supply, oriented towards Tours and Monts.

- The southern branch serving Loches. This line is currently the least efficient railway of Tours star rail. However, the modernization of this line is expected. The axis Tours-Loches has to be developed as a priority, because of the limited rail service and the high demand on this line. The line has several stations and stops. From Tours to Loches, the first station is Joué-Les-Tours, with 1290 departing and arriving per week. The next stop is La Douzillère, the nearest stop to Courelières, located about 1.4 km away. Then come two stations which attract few travelers: Montbazou, with only 350 departing and arriving per week, and Veigné which total 38 departing and arriving per week. The last station that we considered in our study area is Esvres which includes a number of 430 departing and arriving per week.

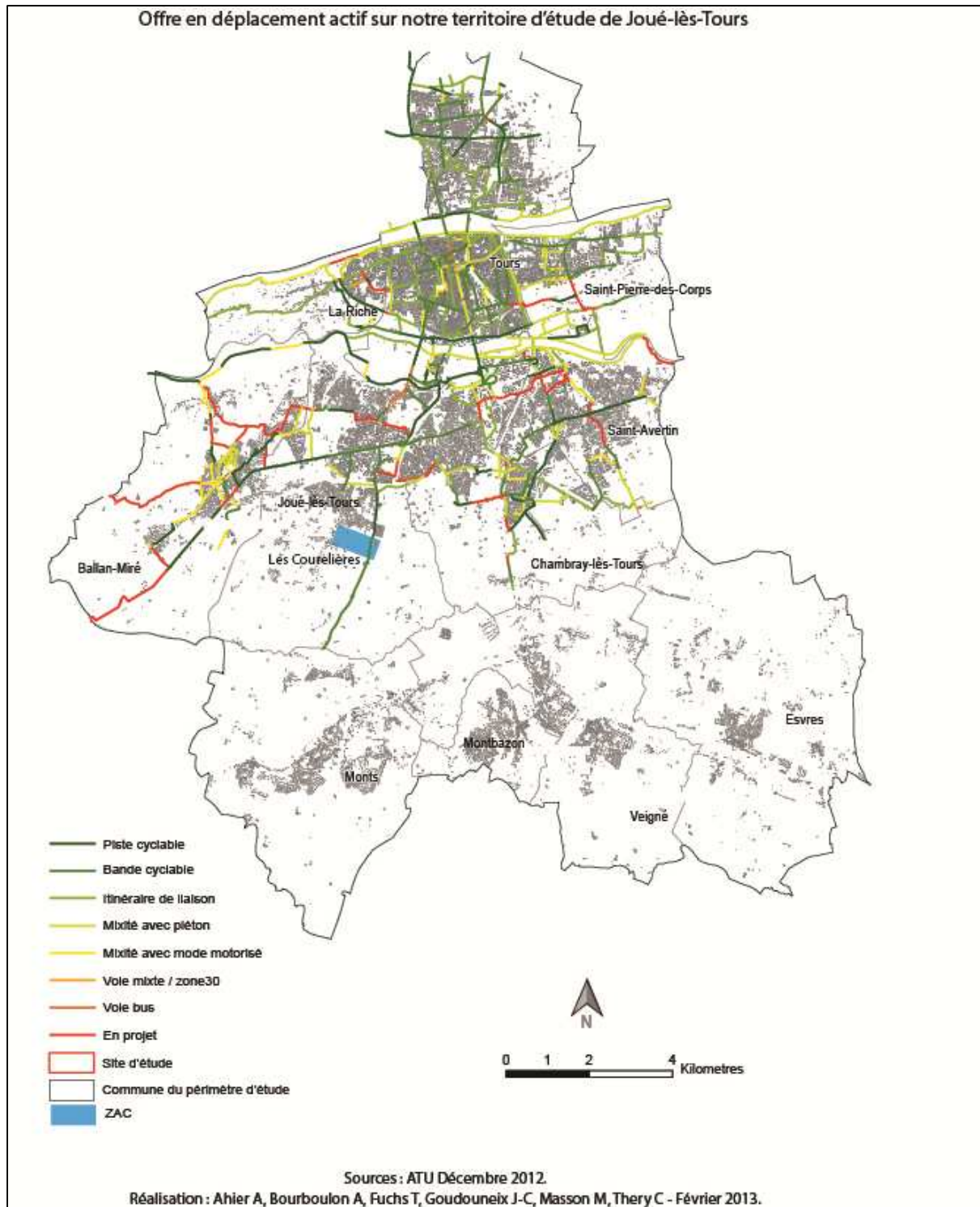
- The western branch leading to Chinon also includes a station, Ballan-Mire (960 departing and arriving per day).

Joué-les-Tours station is located at the confluence of several lines, those from Loches and Chinon. The section between Joué-Lès-Tours and Tours station is saturated, and is identified as the "Joué Traffic jam".

f) Bike paths

Within the Tours Plus conurbation, cycling is particularly useful, especially in the center and its surroundings. There are 1200 city bikes, bicycles rented by Tours and managed by sitcat, and 2000 privately owned bikes. Furthermore, the number of private bikes has to be revised upward. In fact, this number concerns only individual bike users who participated in the marking operations launched by the town to combat theft (Source: Tours Plus). Cycling in Tours Plus is therefore an important means to move around.

What is the real state of the cycle path network in Tours Plus and particularly in Joué-les-Tours, the municipality which is principally concerned by the project?



Bike paths of the Tours Plus conurbation are part of the project "la Loire à vélo", permitting tourist traffic between the cities and castles of the region. Furthermore, we notice an effort to develop a coherent network serving points of interest, such as Tours, Chambray or Balla-Mire. However, this service is not available in Joué-Lès-Tours, despite its status as second town of Tours Plus.

The cycling network in Joué-Lès-Tours is dispersed, heterogeneous. It links by big axes some of the attractive centers such as Joué-Lès-Tours station or schools, mostly along the busiest departmental roads. There are therefore no functional network paths, scaled on the neighborhood and on the town. “La Loire à vélo” includes a section in Joué-Lès-Tours located on the northern boundary, along the Cher. There are, however, only two paths connecting the path to the rest of the city, and therefore there is no cross-sector approach, except the Rue du Pont-Wanting and Taihar Street.

The tram will enhance the development of bike use. The incentives are:

- The ability to take the tramway with a bike;
- The project for the implementation of a cycle track along the outskirts of Joué-Lès-Tours ;
- The establishment of a new park and drive car park equipped with 24 places for bicycles (southern terminus of the line);
- The establishment of a cycle track along the avenue de la République and between Stade Jean Bouin and the Lycée Jean Monnet in Joué-Les-Tours.

g) Analysis of travel patterns

After listing the different transport systems presented in our study area, we focused on the relevance of each of these modes.

Displayed in the two tables below:

Relevance of the different transport systems presented in our study area (interview with the regional direction of the SNCF)

Means of transport	Maximum distance that a user is willing to do	Velocity	Capacity of transport modes (travelers max)	Capacity maximal (number of travelers/day)
Walking	500 – 800m	3 km/h	1	X
Bike	3 km	15 km/h	1	X
VP	7 – 12 km	50 km/h	4-5	X
Car (Fil Vert)	10 – 50 km	50 km/h	70	700
Bus (Fil Bleu)	8 - 10 km	10 km/h	100	4 500 (45 bus/day)
Tramway	25 km	18 km/h	300	55 000
TER	80 - 100 km	100 km/h	150	900

Travel time of the trip: "The Courelières" (center of the future eco-district) to Tours station

	Means of transport	Time	Total time of the trip
Scenario 1	Bike	8 min	28 min
	Tram	20 min	
Scenario 2	Walking	25 min	45 min
	Tram	20 min	
Scenario 3	VP	5 min	25 min
	Tram	20 min	
Scenario 4	Bike	7 min	52 min
	Bus (line 10)	45 min	
Scenario 5	Walking	20 min	1 h 05
	Bus (line 10)	45 min	
Scenario 6	VP	3 min	12 min
	TER	9 min	
Scenario 7	Bike	6 min	15 min
	TER	9 min	
Scenario 8	Walking	17 min	26 min
	TER	9 min	
Scenario 9	VP	20 min	20 min

These tables allow us to highlight the potential of the transport infrastructure located in our study area.

h) Capacity of transport infrastructures

After having created the map that shows the transport network around Joué-Lès-Tours and our site, we focused on the analysis of the potential demand and the capacity of the current network. We first gathered all the information concerning the capacity of the different means of transport (buses, coaches, trams and trains).

Concerning the two Fil Bleu bus lines that pass close to our site, the buses are rigid ones. The capacity of these buses is 100 passengers maximum if we take into account the seats and the standing places. We take into account only the seats, of which there are 70, in the Fil Vert interurban buses.

Each tram is composed of seven wagons for 300 travellers (with 88 seats per wagon). The average speed of the line is estimated at 18 km/h.

Finally, concerning the railway, the Tours-Loches train is the X 72500 (XTER). This train is composed of 2 wagons with a total of 150 seats.

We also analyzed the frequencies of these different means of public transport to evaluate the maximum capacity of the network and then to know the maximum potential demand on the territory. We have considered the ways in both directions.

This analysis highlights the high capacity and frequency of the tramline (One tram every 6 minutes). However we can observe that this future tramline, the Fil Bleu buses and the trains are highly concentrated on the route between Tours and Joué-Lès-Tours.

If we look at the maximum capacity of all public transport developed in the South of our site of study, we can note that it is quite limited. This is a little compensated by a diversified offer: regional buses, departmental buses and national or regional trains.

The current use of the trains by passengers arriving at or leaving the railway station of the South of our territory (Monts, La Douziliere, Ballan-Miré, Montbazou, Veigné, Esvres) is low if we compare with the railway stations of Tours (280000 passengers/week) or St Pierre Des Corps (420000 passengers/week).

Concerning the railway, we have tried to compare and analyze the link between the supply and the demand. We have then focused our attention on the flux between the cities of the South of our territory (Veigné, Montbazou, Esvres) and the city concerned by our project, Joué-Lès-Tours.

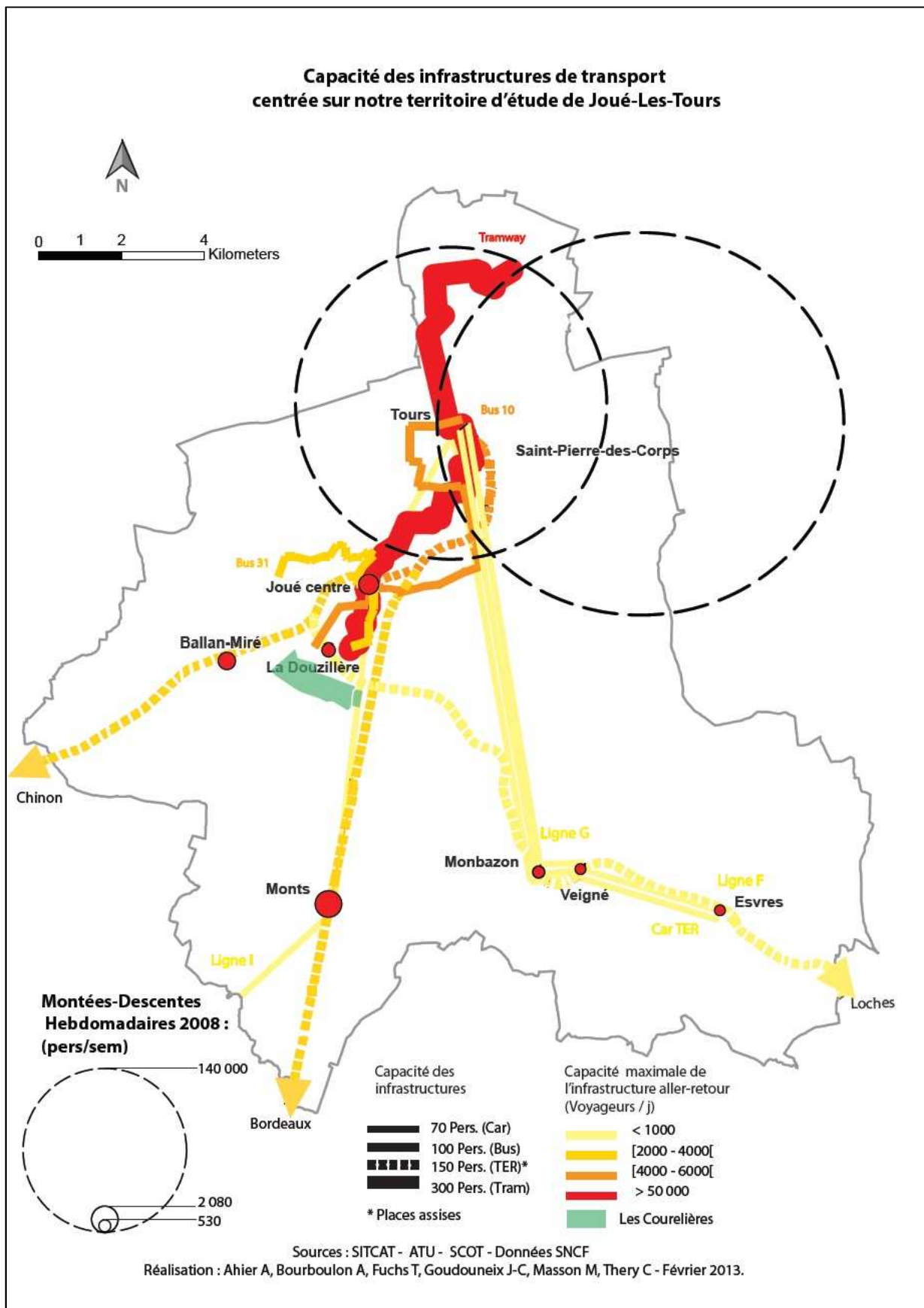
We have decided to treat these cities as an example because the train is the only offer of public transport that exists between these cities.

First, there are 699 people who take daily trips between their homes and their jobs between these cities. The current offer in terms of the train is adapted if we take into account the maximum potential capacity and frequency (900 maximum potential passengers/day).

Then, we observed the division of use between the different modes of transport (personal vehicles and trains) and there are only 13 people (1,85 %) that use the train for their daily trips between their homes and jobs.

The territory has an important potential in terms of railway networks. However, this means of transport is currently under-used. This may be due to problems of timetabling or frequency (For example only 6 trains a day for the line between Tours and Loches)

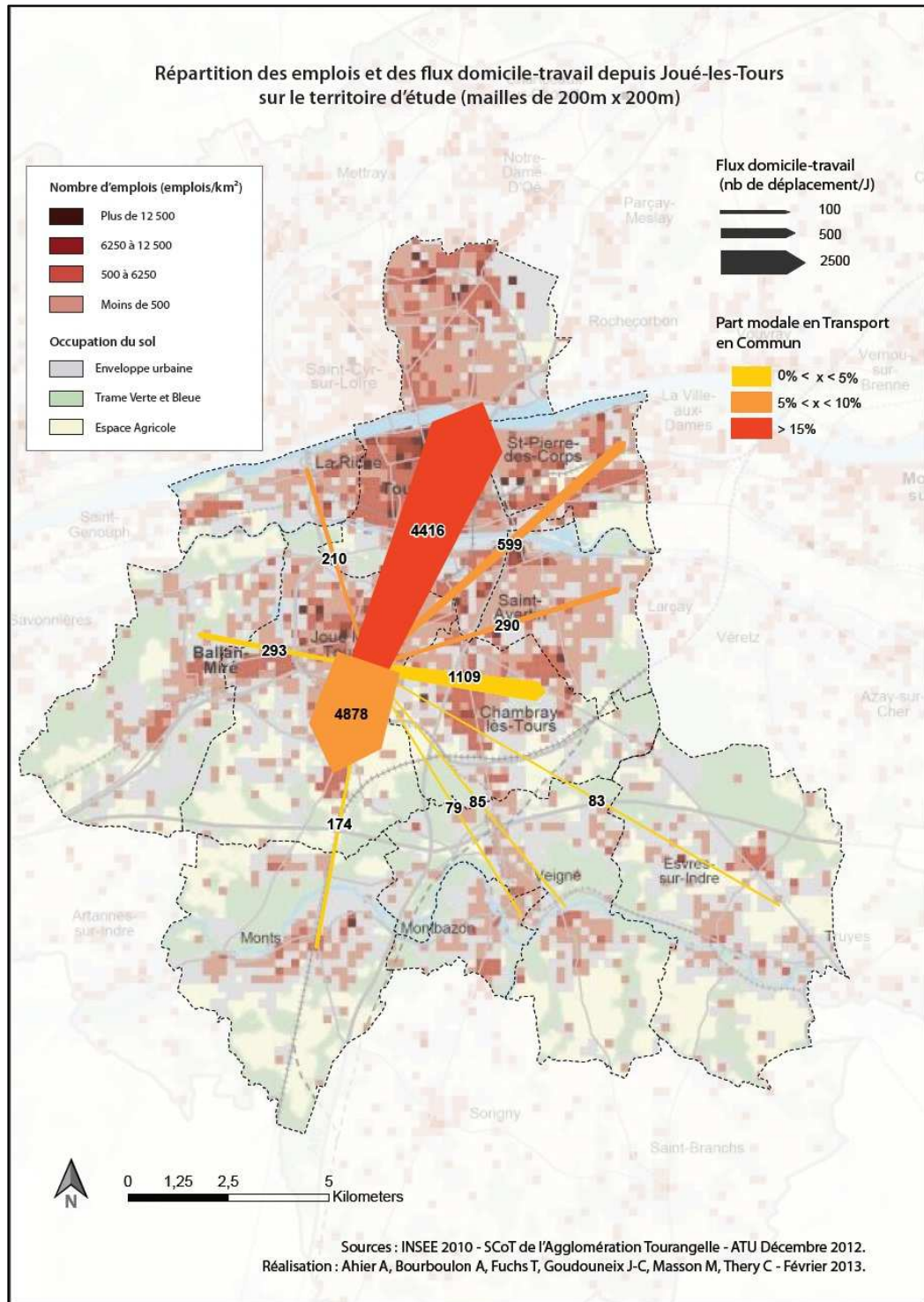
If we look at the flow of commuters between Joué-Lès-Tours and Tours, we can observe that it's the route where the use of public transport is the most important (15%) in our area. In fact, of the 6447 commuters using this route, 1040 people use public transport (buses or/and trains). We can also note here that the offer in terms of public transport is sufficient in term of maximum potential capacity (7000 travelers/day if we add together the buses and the trains). Nevertheless, the margin is weak. But the new tramline will give an important growth to the potential demand on a long term.



2) Analysis of the demand

a) Distribution of employment and House-Work flows from Joué-Lès-Tours

This map represents all commuting flows and employment density in our study area. The development of benchmarks and indicators was done in the following way: in the case of the distribution of jobs, the densities chosen are those of the SCOT, the method used is classic quartiles. This distribution is made on a base map representing the different occupations of the land: urban, green and blue frame and agricultural space.



The set of House-Work flows from Joué-Lès-Tours was represented with arrows whose size and color are quantitative and qualitative indicators. The size of each line reflects the number of trips per day (INSEE data) and expressed in proportion to this number the assets of moving persons to other communities in the area but also inside Joué-Lès-Tours. The color of each arrow represents the modal part of public transport use by active inhabitants; every nuance is considered as low, medium or high.

Summary table of House-Work flows from Joué-Lès-Tours INSEE data):

Code INSEE	Origine	Code INSEE	Destination	2 Roues	Marche à pied	Pas de transport	TC	Voitures, camions, fourgonette	Total
37122	Joué-lès-Tours	37018	Ballan Miré	3%	0%	0%	3%	94%	100%
37122	Joué-lès-Tours	37050	Chambray Les Tours	6%	1%	0%	5%	88%	100%
37122	Joué-lès-Tours	37104	Esvres	5%	0%	0%	0%	95%	100%
37122	Joué-lès-Tours	37122	Joué Les Tours	6%	13%	8%	7%	66%	100%
37122	Joué-lès-Tours	37195	La Riche	5%	0%	0%	6%	89%	100%
37122	Joué-lès-Tours	37154	Montbazon	5%	0%	0%	1%	94%	100%
37122	Joué-lès-Tours	37159	Monts	3%	1%	0%	3%	93%	100%
37122	Joué-lès-Tours	37208	Saint Avertin	1%	0%	0%	8%	91%	100%
37122	Joué-lès-Tours	37233	Saint Pierre des Corps	8%	0%	1%	6%	86%	100%
37122	Joué-lès-Tours	37261	Tours	4%	1%	0%	17%	78%	100%
37122	Joué-lès-Tours	37266	Veigné	15%	0%	0%	0%	85%	100%

This map was produced in order to assess its attractiveness for each municipality in terms of employment, and oppose it to the number of active persons taking public transport. We note that movements within Joué-Lès-Tours are the most important trips (4878 employees). The relatively medium use of public transport and alternative modes shows that it is possible to increase and better serve this municipality.

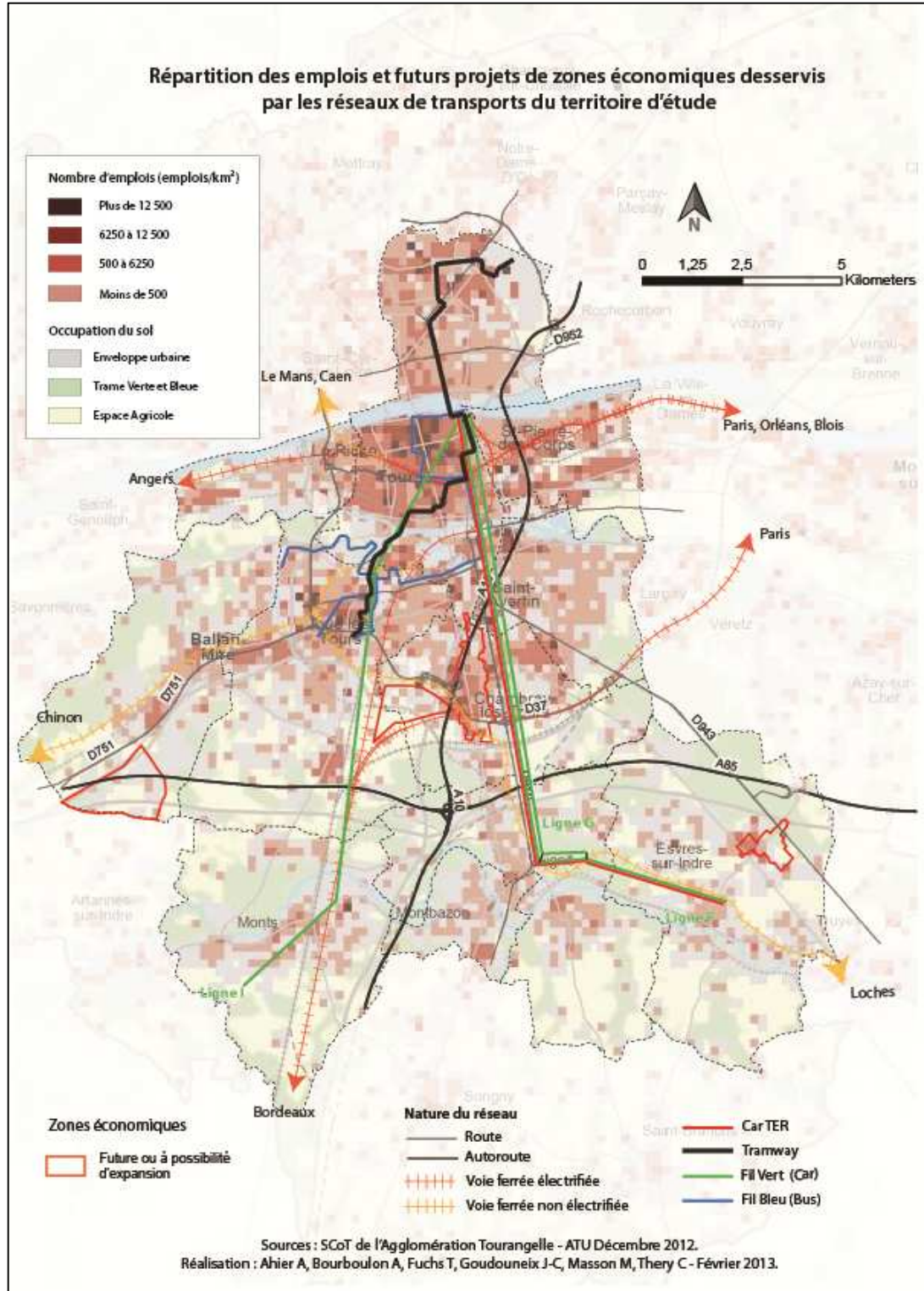
The second pole of attraction is Tours with a movement of 4416 active persons. The modal part of alternative modes to the car which is relatively high reflects a better quality of service on this section than on the other segments from Joué-Lès-Tours to the other municipalities of our study area. Finally, we can differentiate two main categories of municipalities: those located in the North: Saint-Avertin, La Riche and Saint-Pierre-des-Corps, and those located to the south of the center of Joué-Lès-Tours: Ballan-Mire, Chambray-lès-Tours, Monts, Montbazon, Veigné and Esvres.

If attractiveness is generally relatively low, we can see that the municipalities of the "North" maintain some connections by larger public transport, suggesting that this crown near Tours is better served than all the municipalities located more in the south.

Joué-Lès-Tours has, with the center of Tours, a privileged relationship with a strong axis. At the same time, inter-municipal movements, very low, could lead to the following interpretation: Tours centralizes all inter-municipal trips related to work places, while between them the other municipalities are generating only few movements. We consider it is an organization with strong centripetal movements.

b) Distribution of jobs and future economic zones served by transport networks of the territory

To know the current serving of employment areas, this map shows the different transport infrastructures but also the number of jobs per km².



Concerning employment, it is represented using gridded data divided into four classes ranging from less than 500 to over 12,500 employees.

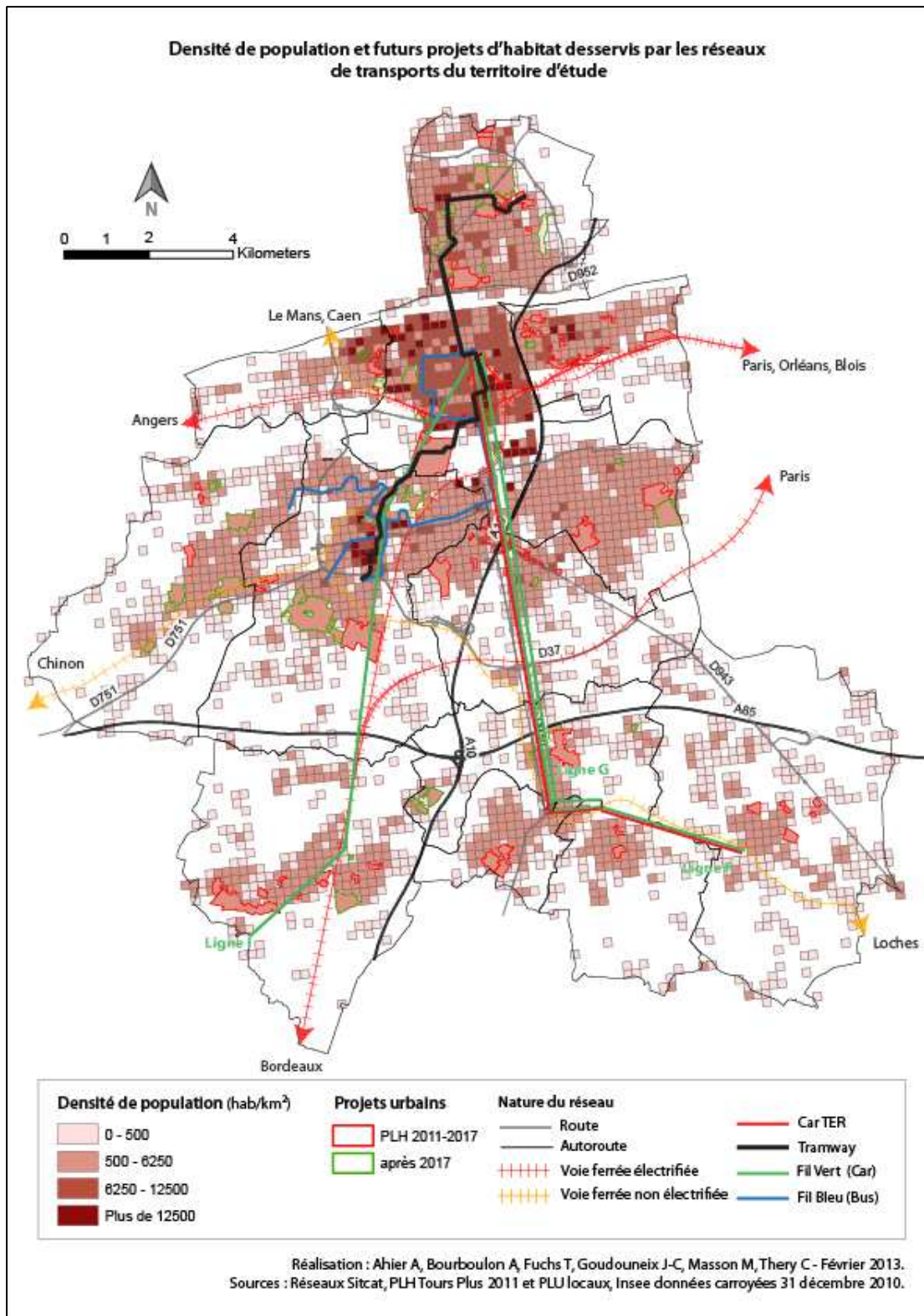
Areas with high densities oppose the peripheral areas predominantly occupied by agricultural land or the green and blue belt.

Secondly, the study area is served by various types of networks that allow the transport of the active population. The entire network has various facilities such as road and rail networks along the lines that are electrified or not. The road network is used to route private vehicles but public transport of the city and the department too.

This map shows that transport networks are priorities in areas of high employment, such as Tours or Joue-les-Tours. The tram can move employees quickly from these two major locations in a north-south axis. Fil Vert and Fil Bleu networks mesh the secondary clusters of employment, which are located in central and periurban municipalities. The rail network allows residents from the south to go to their employment areas located further north. This can be done directly by going to the stations located in the vicinity of the workplace and if necessary, changing their mode of transport to reach it.

Future economic zones, that are located in the municipalities of the second ring, are currently very poorly served by public transport. For example, areas of Carrefour Touraine or Even'Parc, located outside these networks, will give no other choice to their employees than to use their cars. That's why it is important to consider the future service in public transport in these areas. However, for future areas of Vrillonnerie and Liodière their proximities to the railways will eventually facilitate their routes if new rail stops are installed or moved.

c) *Distribution of population and future housing zones served by transport networks of the territory*



This map of our study area shows the current density of population and the future density of housing projects. It seems very important for us to know this information. We used the gridded population data from INSEE 2010. These data group together the number of people in a squared area of 4 ha. This technique allows us to have a better knowledge of the density than with the IRIS data. To classify the different densities, we have chosen to use the same one as the Planning Agency of Tours (ATU). Thus we can compare our maps and the one they did. It is a good coincidence that the central value of this classification: 6250 inhabitants per square kilometre, is almost the same value as we chose at the beginning: 7000, which is the minimum density of population to build a tramline. For the future housing project, we have attributed to each one a density of population according to the prescriptions appearing in the Tours' SCoT (A document of regional planning). These prescriptions are in housing per hectare. We have fixed a rate of 2.1 inhabitants per dwelling to obtain a density of population by square kilometre, which can be represented on our map.

This map allows us to locate the commuting needs from house to work on our study area. At first, we have considered the current commuting needs. These needs are located in a hub which counts Tours, La Riche and Saint-Pierre-des-Corps municipalities. Joué-lès-Tours has an important population density too and potentially great commuting needs. A moderate density characterized the first periurban ring and the municipalities located in the rural area. In the second step, we have considered the future density of the housing projects. We can see that these projects are located mostly in the first periurban ring and in the rural municipalities. All these projects have a mean density and are in a situation of urban sprawling.

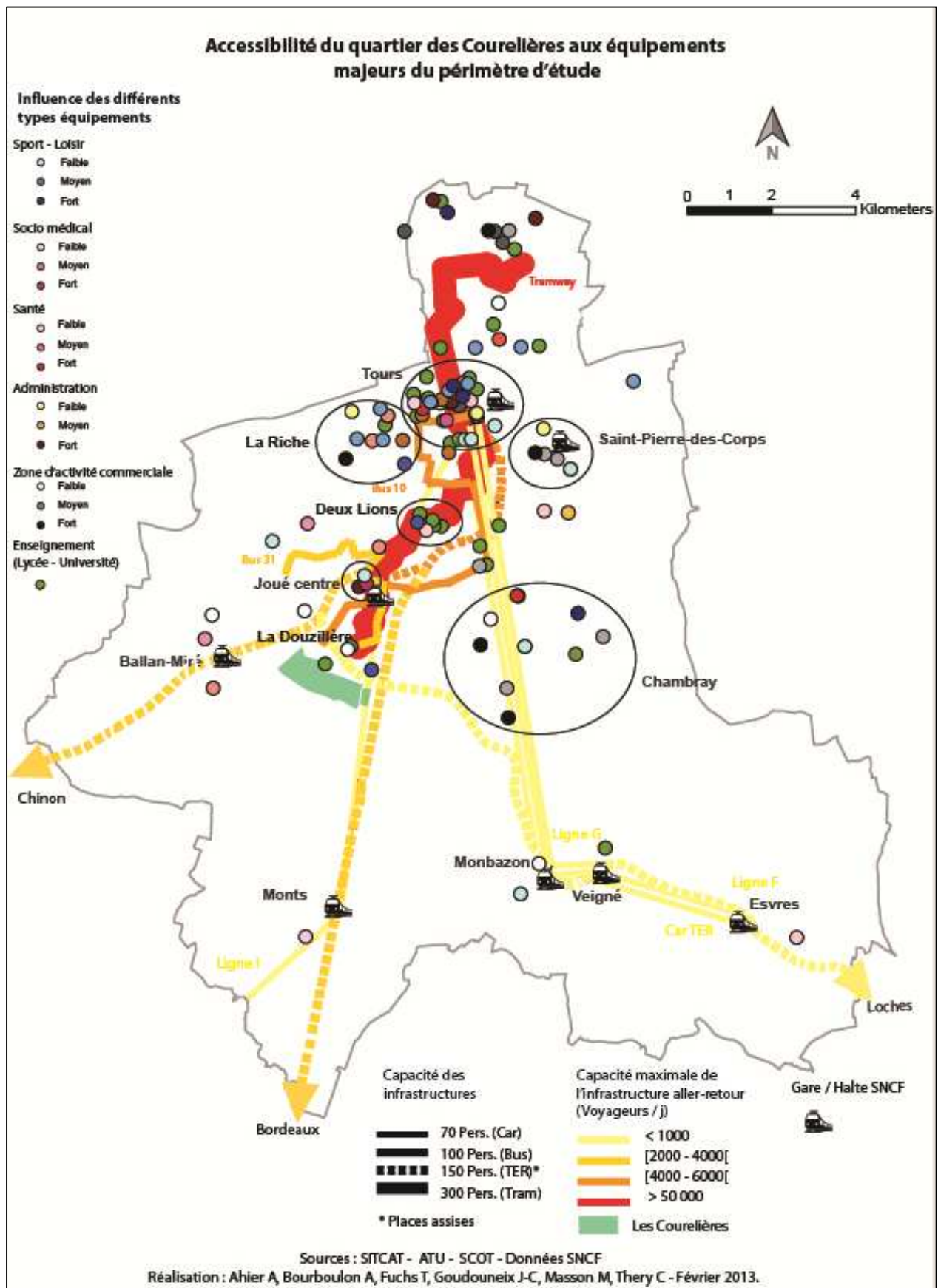
When we cross the supply of transport with the location of population densities, it is found that the public transport generally irrigates areas of higher density in the case of transport operated by the city, while the county and regional transportation serve the municipalities located in the suburban areas, which have a less important density. The mesh in transit, although it is centred on the city of Tours, provides good coverage of the main areas of density. Access to individual vehicles across the study area is good with the presence of two motorway sections - the A10 and A85 - and many primary roads to irrigate the study area abundantly and also the future district of Courelières. Major housing projects are located in the inner suburbs and generally in a situation of urban sprawl. Their service in transit will therefore require an extension of these networks to serve them, which is likely to reduce the effectiveness of existing lines extended. Car use is not limited by the capacity of the infrastructure, so it is important to think about the future network service to these areas to be sufficiently efficient and attractive to newcomers.

3) Linking supply and demand

a) Centers of activities and attractivity

On this map the biggest poles of activities (leisure, shopping, high-street spending...) are shown, to identify which zones were the most attractive to people from the municipalities of our study territory. So we considered as important motives of travel every service related to health, sport, etc.

For each type of service we selected the most appealing, based on the number of salaries. This indicator seemed relevant to distinguish poles of big attraction, big enough to be on the map.



Local facilities are those which were automatically eliminated because short distances do not need to be carried out by public transport or car. Mapped information is broadly considered by INSEE as medium and high-range. Different threshold values retained for our study were:

- Sport and leisure facilities operating with more than ten employees,
- Socio medical centers and stores of more than fifty employees,
- Administrative facilities which employ more than two hundred people. This includes principal city halls like Tours' one or institutions such as the Tax Agency or the CAF.
- Secondary education. We chose high schools and universities only, because of their capacity to attract people from a wide area.

The quantile method was used to characterize the « size » of each pole, and then we had three kinds of classes. Those classes represent three levels of attractiveness: low, medium and high. But a lot of installations still need to be localized. For reasons of clarity we decided to translate this data into graduated colour swatches and not into proportional pictograms.

The merging of the facilities capacity map with the centres of activities and attractivity map shows on the one hand the most attractive centres, that is to say, the darkest ones, are concentrated in the Tours municipality. On the other hand, it reveals a wide variety of facilities on the same territory; it means that this territory is the main pole. Secondary poles stand out in the Deux Lions district (Tours), in the municipalities of La Riche, Saint-Pierre-Des-Corps and Joué-Lès-Tours characterized by a minor density and activity. In the Deux Lions neighbourhood we've noticed a strong involvement in the field of education: the law faculty of the Rabelais University and Polytech'Tours with its different antennas. A mall is present in this place too: the Heure Tranquille. On the western municipality of La Riche are most of the cultural facilities and an important commercial area, the Géant one. In the East conglomeration is Saint-Pierre-des-Corps where the commercial area Les Atlantes is the most important destination of the town. In Chambray-lès-Tours, the reasons for mobility are spread on a relatively vast zone and include a remarkable diversity of services and commercial areas: Auchan, the Trousseau Hospital and the University Sport Center. Joué-Lès-Tours does not concentrate many facilities but the few existing ones are important socio medical and administrative poles.

The six identified actors concentrating most of the education, services and leisure (Tours downtown, La Riche, Saint-Pierre-Des-Corps, Deux Lions, Chambray and Joué downtown) are not directly accessible from the future neighbourhood of Les Courelières. Capacities of the public transit are important near the neighbourhood. Even if it doesn't arrive there for the moment, it is essential to connect it with existing public transports, in order to limit car use. These connections need to be direct and simple between Joué, the Deux Lions neighborhood and the city centre of Tours. Two sectors are indirectly accessible by a public transport transfer in Tours Centre: La Riche and Saint-Pierre-des-Corps. These last three sectors are rich in big commercial areas and it can be easily reached by car. Chambray-lès-Tours is not directly accessible because it is situated on the East side of the district and because public transport is organized in a Tours-centred way.

4) Conclusion of the diagnosis

Following our assessment we notice that the various transport infrastructures stop just over the limit of the future project of Courelières (except the lines of Bordeaux and Loches and the A10 which allow a North-South link).

Through our diagnosis, we tried to combine the fields of relevance of the different modes of public transport depending on the density of population. Above 7000 hab / km² the tramline (Contrat d'axe de Grenoble et Toulouse, Julien Montet, CERTU September 2008, 126 pages, License) and light rail are good solutions. Below 6,000 hab / km² we consider it is more the field of the bus and minibus.

For the lowest densities which are precisely those found in suburban areas where the population density is less than 2,000 inhabitants / km², there are currently no transport modes which can enter in competition with the car. The density proposed within the Courelières neighbourhood, being approximately 4200 inhabitants / km², we can consider it as relatively low. But a major problem is encountered in low-density neighbourhoods: the breaks during the trip.

For all these reasons for travel: work, leisure, shopping, services ..., the inhabitant of a low-density neighborhood usually has a choice of two routes:

- Take their car and use it the entire journey;
- Take the car or bus to a tram or train station nearby.

Therefore, they will often need to change the mode of transport during the trip. These breaks, to switch from one mode to another, are not well perceived by the traveler. They imply waiting, some fatigue, a loss of time and discomfort.

To compete with the private car in the loose urban network, we have to take into account these two aspects. We must create new modes of transport which are economically viable in a dispersed area, but must also propose solutions to the breaks during the trip, in order to consider intermodality as an effective and attractive solution for the traveller, and not only beneficial to the community. The development of transit areas in service areas is a first response in the sense that everyday tasks can be performed, so the feeling of wasting time is reduced. But we must think of other solutions, because the demand for mobility is growing. Moreover, the dissociation of dwelling, work, shopping and leisure places, and also the reduction of working time and the increasing mobility demand for leisure activities, all of these reasons are challenging the use of a rigid transport system.

In addition, for the general public, the car has a very positive image. It is associated with the idea of freedom. We saw that in Europe, one car trip out of eight has been made on a distance of less than 500m. The car has become an everyday and individual object, personal and customizable, an easy and free service because the driver does not know how to measure the cost of such a short trip. New transit services that would be able to compete with the car should not overlook the ease of use and comfort.

Looking at all the different maps we made, allowed us to obtain information about the characteristics of supply and demand in our global study area and the future Courelières' s quarter. From the scale of our study area, we notice that both public transport infrastructures and those that support individual movements (roads and highways) are unsaturated. They are all radially centred on Tours. The supply of transport infrastructure can be described as large and diverse. Regarding the future quarter of Courelières, we find that the transport supply is present in a close perimeter

(around 1 km). Furthermore, this supply is double because we have on the one hand a connecting line in the municipality of Joué-lès-Tours (Fil Bleu bus line n°31) and other direct lines to the municipality of Tours (Fil Bleu bus line n°10 and tramline).

On the scale of our study area, the demand for all travel (work, leisure, services, shopping...) is high on the North-South axis from Joué-lès-Tours to Tours. Concerning the major poles, generators of trips, we can see that they concentrate mainly near Tours and in a more diffuse way in the municipality of Chambray-lès-Tours. This shows the dominance of the municipality of Tours as a central attractor of traveling flows with little competition from the other municipalities. However, we notice that on the data of House-Work flows, internal movements within the municipality of Joué-lès-Tours are slightly higher than the flows going to Tours. Concerning the Courelières's quarter, the analyses of its future needs in movement and travel led us to the consideration of its potential density that will be around 4,000 inhabitants /km². We hypothesize that travel flows will go in equal proportion to Joué-lès-Tours and Tours.

The distance between the future quarter of Courelières and the existing public infrastructures make us believe that car use will be consistent in this area. To promote alternative modes, we analysed all the travel options from Courelières to the rest of our study area. In order to achieve this, we studied the active modes, but also public transport with their frequency of passage and their respective capabilities and characteristics of travel. These studies have determined that it would be wise to develop and extend public transport networks in order to irrigate the quarter area in an attractive way.

However, the organization of this quarter raises a question of scale. The future quarter of the Courelières is part of a larger scale that should be taken into account in the proposals for future services in this area. Two hypotheses arise: the first one is to consider the presence of this quarter as a gateway of Tours' agglomeration that we will call the hypothesis of 'drawdown', and the second one is the development of this area as a 'polycentrality'.

III) Proposals

1) Centrality/Drawdown

Following the diagnosis and facing the complexity of our study territory's organisation, we had two choices for analysis and to propose solutions. Two very different points of view which determine the transport networks modernization.

The first of these is to consider Joué-lès-Tours as a full centrality. And preference should be given to it over other poles of the conglomeration.

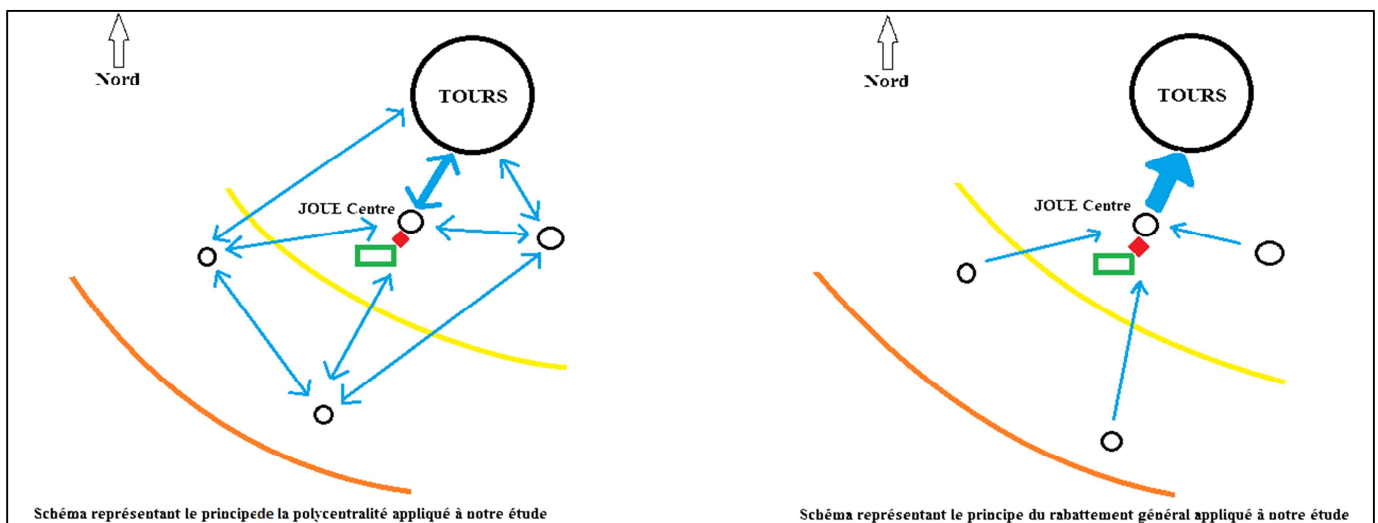
So we'll focus on the Courelières neighbourhood as a dependent zone on Joué-lès-Tours centre and its connection with it as a natural continuation of its building. This is the solution that seems the most obvious because it consists in bringing few users to the centre city of Joué-lès-Tours, and then to Tours or the rest of the territory.

This method of organisation refers to a primary poles network (here it is Tours) supported by a secondary and tertiary poles network (Joué for instance) all connected by some adapted infrastructures. This means serving every part of Joué's surroundings and linking it with Joué centre: Ballan-Miré, Monts and the different ZAC. The connection with Tours will thus be on the scale of the service of Joué-lès-Tours and Les Courelières.

This point of view considering Joué-lès-Tours and Les Courelières as a full centrality presents a major shortcoming: a lack of larger scale and longer vision of the functioning of the entire city. Joué should not be only considered as an independent centre connected with the rest without any consequences on people moving and commercial implications. Consequently, the alternative to this solution is to regard Joué as a « door » towards the urban centre, a simple step for the travellers coming from the South. This theory is called the « drawdown » theory, and means used are technically more important because the number of people concerned by it increases a lot. Such a scaling up involves an increase in the moving capacity of the current public transport networks.

The key advantage of the « drawdown » theory is to integrate Les Courelières system-wide and to engage an active reflection about every theme of urban development.

This approach of resolving the problem will be the « drawdown » one because it is concomitant with the urban area diagnosis and because this point of view is more connected with the reality of our study territory. In the proposal part of this work we'll develop solutions for this problem according to the « drawdown », but we won't neglect the polynuclear aspect of the site.

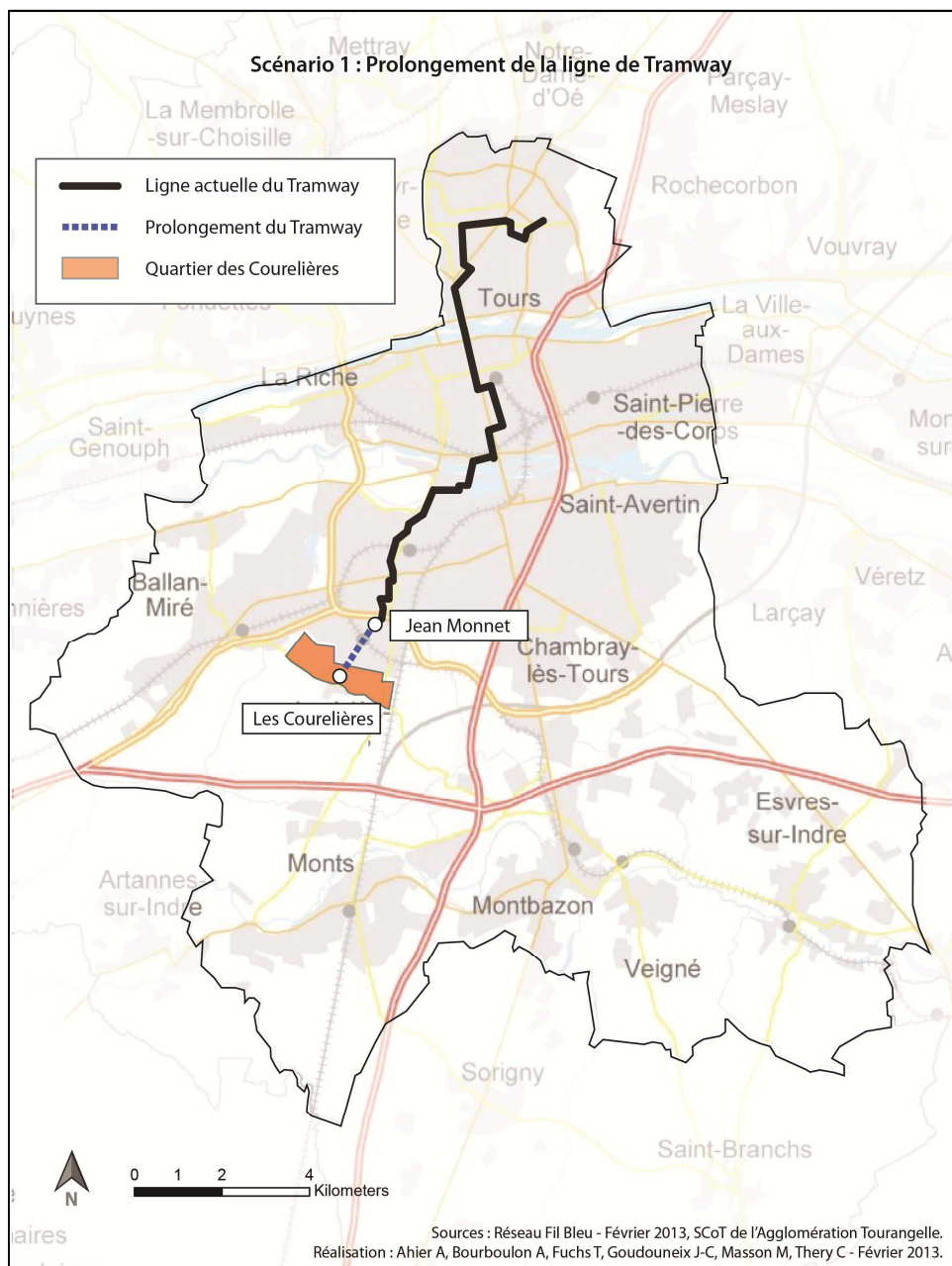


2) Presentation of the options

a) Option 1: the tram line's extension

Our first scenario is the extension of the tram line. It involves the establishment of a new tram terminus at the Courelières' project.

This option has several weaknesses. Firstly, it has to acquire the land for the expansion of the tram. It is a long and expensive process, because the land does not belong to the municipality. In addition, it takes about 20 million euros / km (according to Olivier Schampion's interview) for the extension of a tram line. MrDefouilloy, the Technical Manager of the City of Joué-les-Tours has assured us that this option was not a priority for the city. Indeed, the Courelières' project involves few people in the short term and the second tram line connecting the hospitals and the station of Saint-Pierre-des-Corps is preferable for the city.



b) Option 2: the tram-train's extension

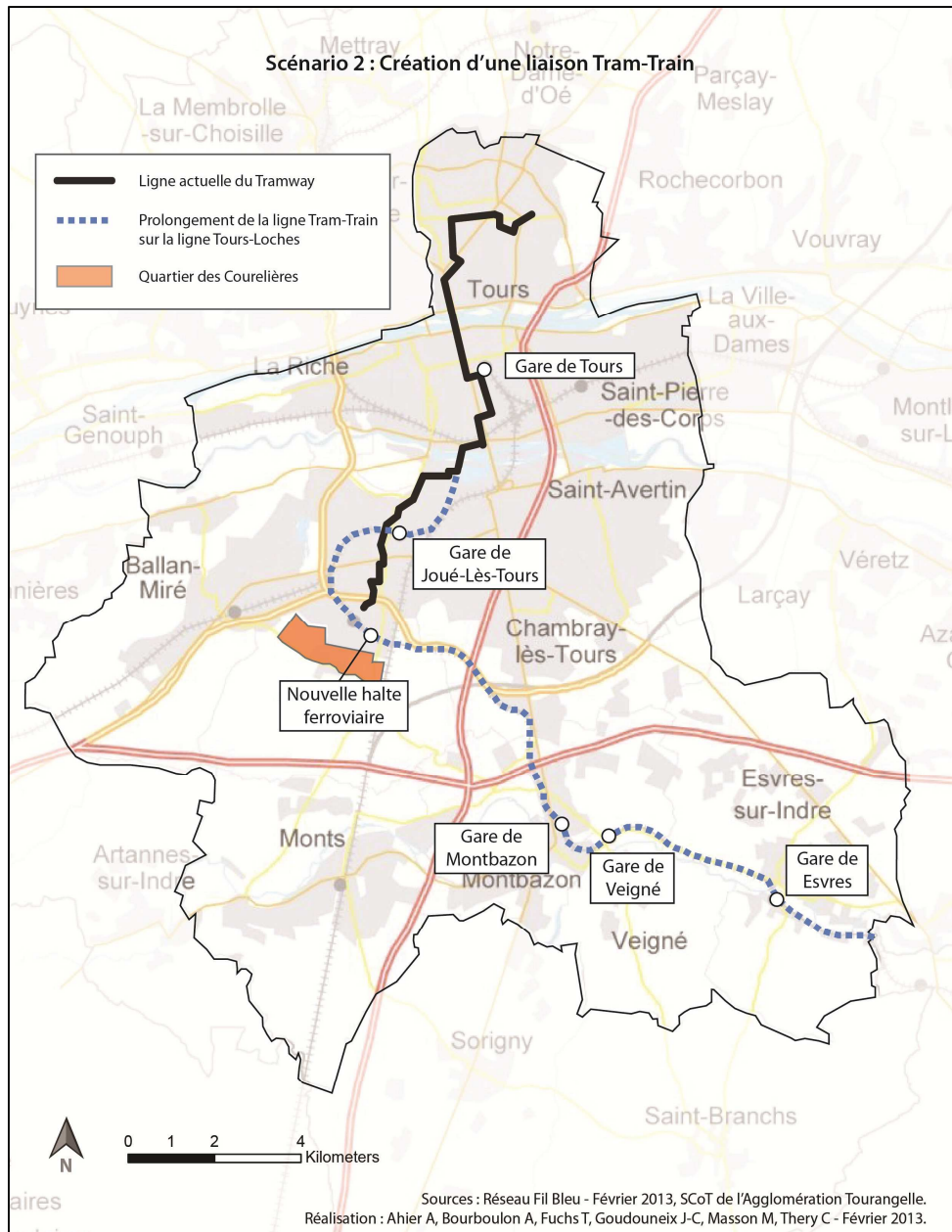
Our second option involves firstly the extension of the tram to the railway Loches and the establishment of a tram train on the track from Loches to Tours. A railway station will also be created at Courelières. The halt of La Douzelière is 'paused' in compensation.

A tram-train is a light-rail public transport system where trams run through from an urban tram network to main-line railway lines which are shared with conventional trains. This combines the tram's flexibility and accessibility with a train's greater speed, and bridges the distance between main railway stations and a city centre.

There is also a train-tram, which is a train also modified to run on tramlines. Generally, the tram-train and train-tram are interchangeable, although a train-tram is based on a train design modified to also run as a tram and a tram-train is based on a tram design modified to also run on a train line.

The tram-train concept was pioneered with the Karlsruhe model in Germany, and has since been adopted on projects such as the RijnGouweLijn in the Netherlands, at Mulhouse in France and in Kassel and Saarbrücken in Germany.

The Loches line having only one channel represents a limiting factor for the tram-train. The ability to cadence the tram will be much larger than the tram-train, which will lead to congestion at Joué-lès-Tours. Difficulties related to the expansion of the tram, explained in Scenario 1, are also found here.

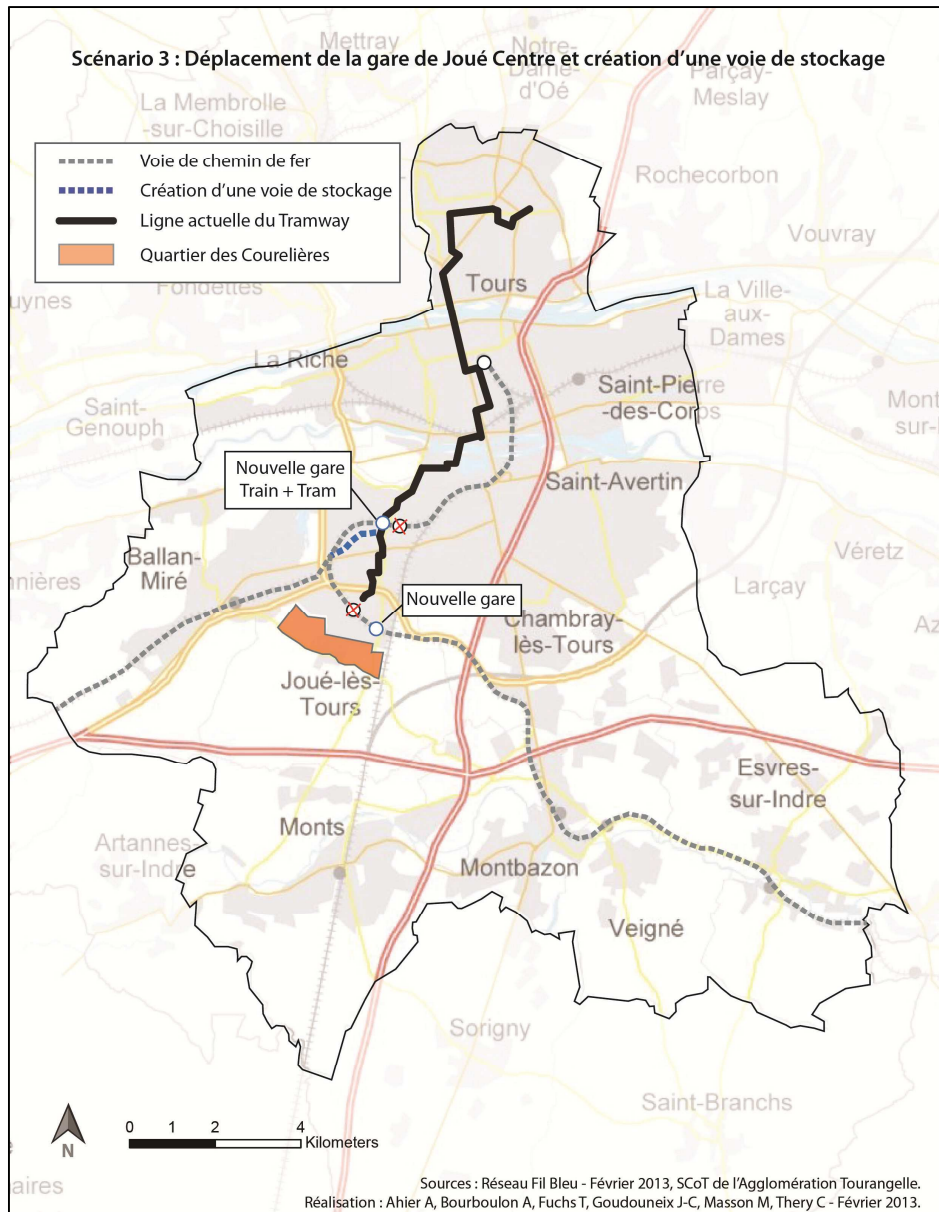


c) *Option 3: Transport's intermodality at Joué-lès-Tours*

This option includes the creation of a railway station at the Courelières' project neighbourhood. For compensation, the stop at La Douzelière will be put on standby. At the station of Joué-lès-Tours, a storage function will be implemented.

Loches Station, soon to be renovated (according to Olivier Schampion's interview) may allow a higher train cadence until Joué-lès-Tours. Work on intermodality should be done at the connection between the station Joué-lès-Tours and the nearest tram station, located 4 minutes' walk away.

This scenario had been considered by the SNCF twenty years ago (according to Mr Dufouilloy's interview). In addition, it is possible to move the dock to the train station near the tram stop. Joué-lès-Tours' intermodality connection will be facilitated.

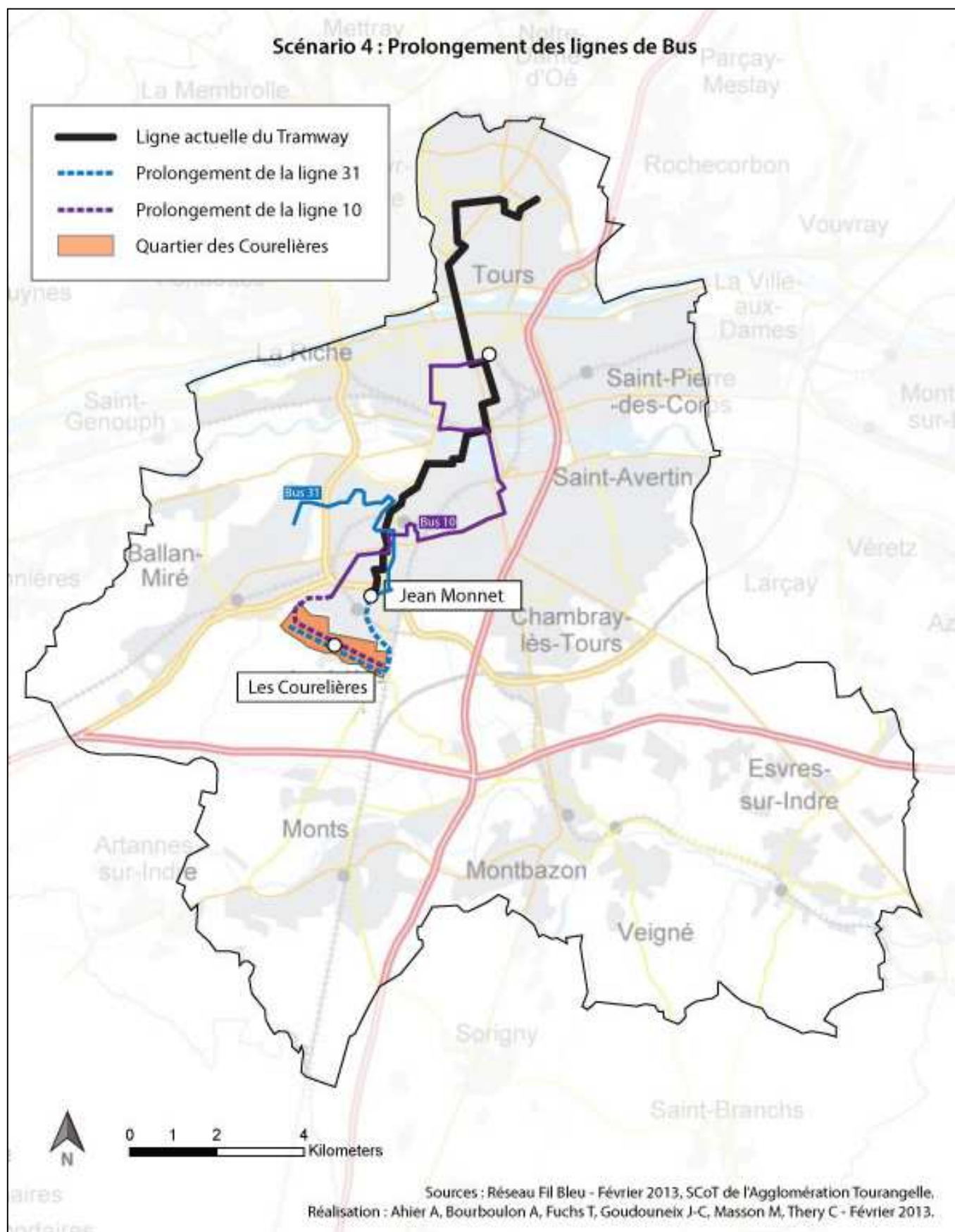


d) Option 4: Drawdown by bus

The creation of a new bus stop at the eco-district permits a connection to the tram terminus Jean Monnet, or further to Joué-lès-Tours's center. This is also the option envisaged the sitcat by implementing a transportation service on request named "Flexo" (according to Anne Bernard's interview). This is a service where the customer can ask the driver to make a detour at preset stops.

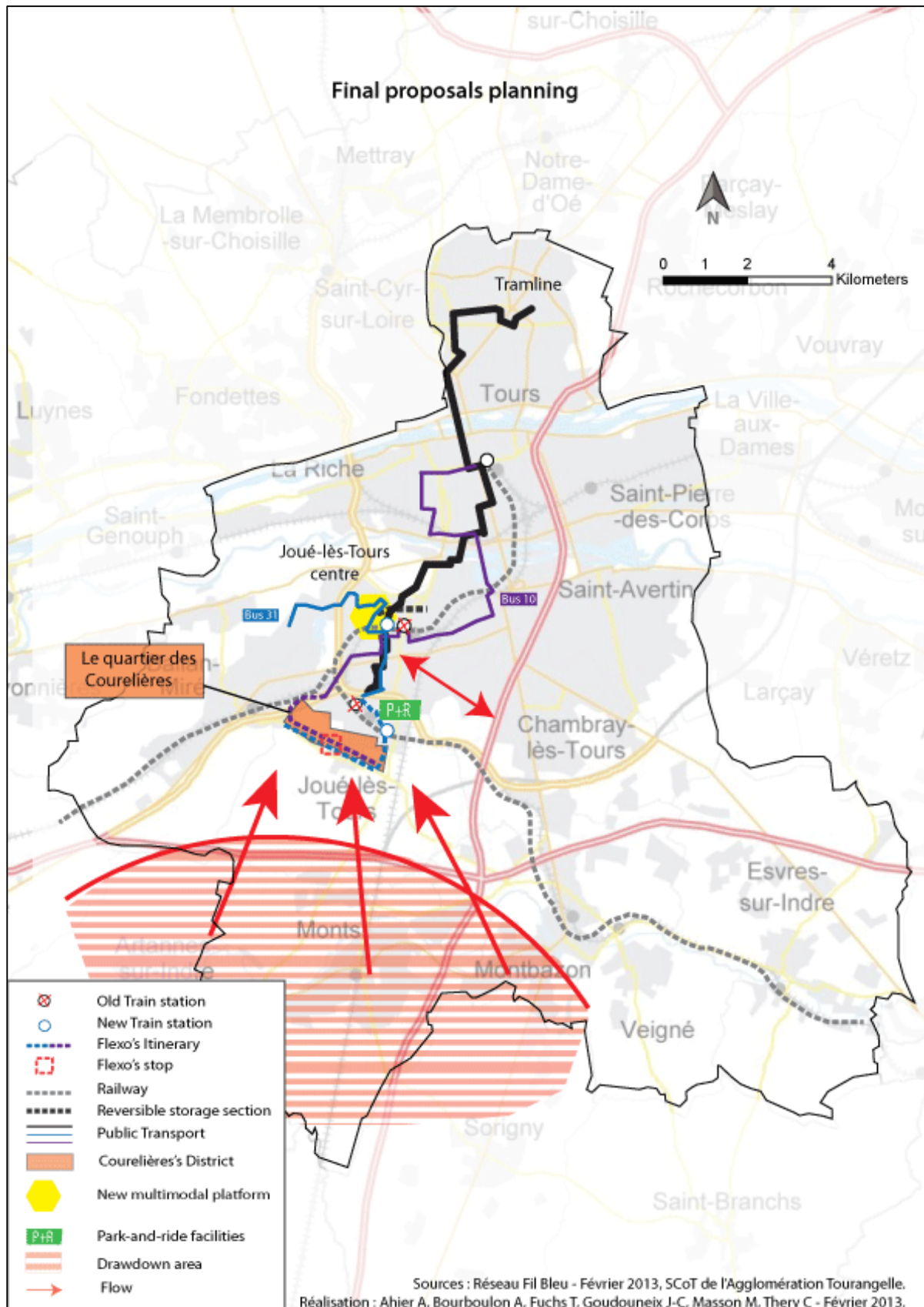
Fil Bleu must be contacted one hour before taking the bus if the point of destination involves a deviation. Bus connection via tramway is also expected. This is a good way to assess the need and demand of people which can later lead to the creation or extension of a line.

Currently a park and drive car-park, open only to subscribers or users of the bus, with 250 parking places is provided at the tram's terminus: Jean Monnet. Moreover, all the car parks must have a bicycle park. The drawdown from car to bike will be preferred. The park will provide direct access to the tram, without detours (according to Anne Bernard's interview).



3) Final proposal

Once we have provided and proposed a diagnosis with different options of the study area, we have decided to suggest our own vision of the project. This final planning proposal is presented on the map below.



In order to connect the new district called “Les Courelières” to the current network, we have chosen an implement which is a blend of the third and fourth scenarios.

From the third option we have kept the new location of the two train stations (Joué-lès-Tours and La Douzelière) but also the reversible storage section in Joué-lès-Tours to restrict the congestion to Tours’s railway station. These facilities may allow the enhancement of the connection between the tram, buses and trains to promote a new multimodal platform in the center of Joué.

Furthermore, another park and ride will be set closed to the Douzelière’s railway and near the ring road to facilitate the passage from the private car to public transport such as bus, railway or tram.

From the fourth option, the extension of both bus lines to the eco-district will link this new district to the current network. Next, the transportation service called Flexo will serve the locals and seems to be a relevant means of transportation to gauge demand of this new area. For the future, we may shift to a permanent section and plan to develop an exclusive right of-way public transport inside the district with a high level of service buses.

Overall, our options suggest a drawdown system where the future inhabitant from the eco-district will move to the downtown of Tours to work and to find services and amenities. To allow this movement, we thought about a development of the current transport network to encourage the use of public transport instead of an individual car. This gain of time, ensured by important infrastructures will place Joué-lès-Tours as an opening to go to the Tours’s municipality. All these facilities such as park and ride, the extension of current bus line thanks to Flexo service, the displacement of the railway station have been planned to that end.

Moreover, we have to insert this project on a larger scale because it will involve new flows, new needs and new demands. Indeed, the area of influence of Joué-lès-Tours will increase and become more prevalent, attracting the south municipalities like Monts or Montbazou. In the future, this “gate” of Joué-lès-Tours will drawdown more and more people and farther away from home. Thus this broad project will play a role in the development of Joué-lès-Tours as well as in terms of shops, services, housing and jobs. Consequently, this new attractiveness will enhance the influence of Joué-lès-Tours as a new centrality. After having set up the North-South axis, it will be interesting to add another axis between Joué-lès-Tours and Chambray because of the important flows of home-work commuting and other motivations (such as commercial amenities), in order to develop the link these two municipalities.

4) Conclusion

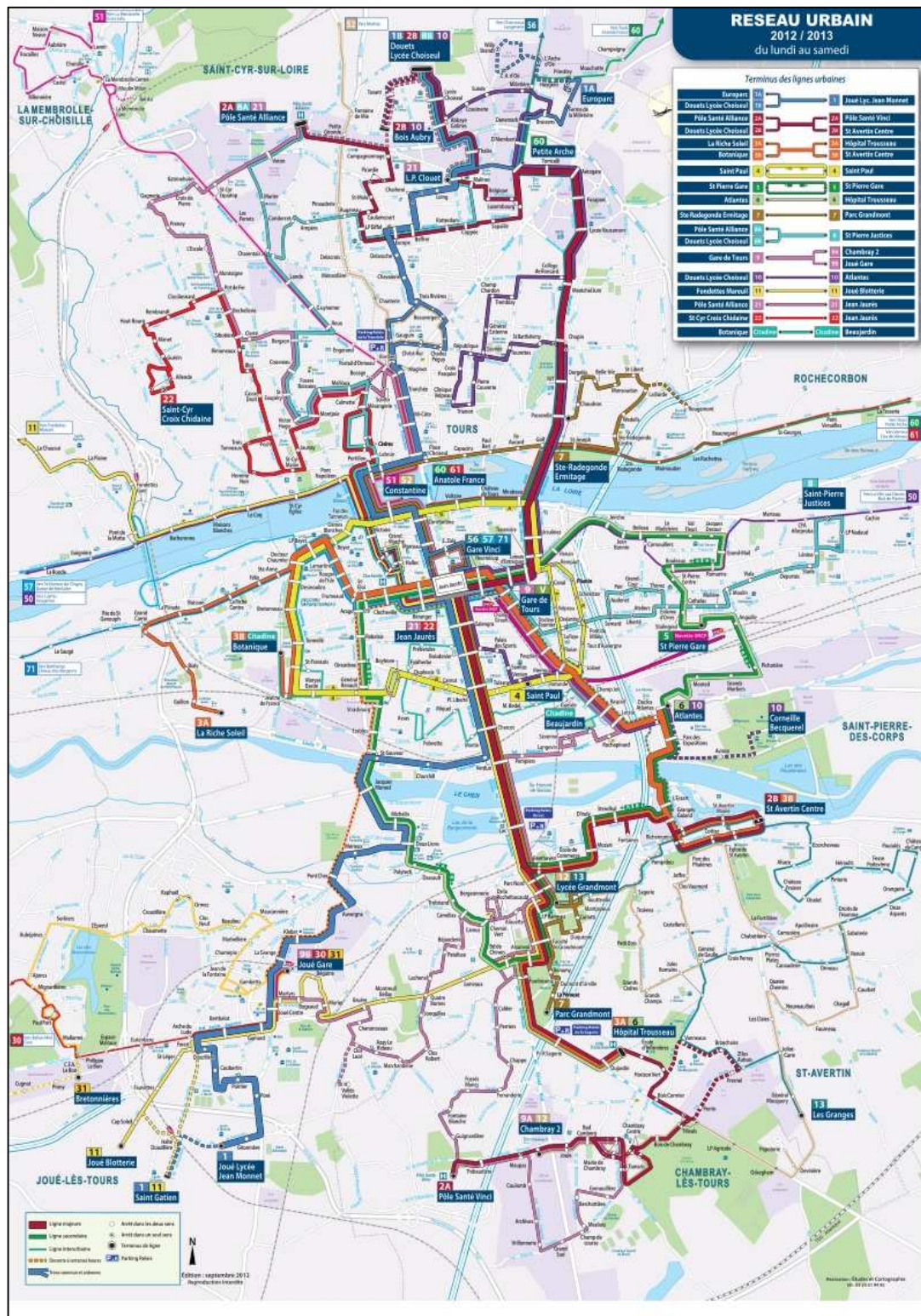
In urban planning there is never one solution, the one that could resolve all the issues and take into account all data and expectations. Moreover, we tried not to select one answer to the question but to present every possible one that could be relevant in our situation and according to the aims of the city actors we met.

What seemed to be a simple problem of serving and connecting a neighbourhood to the rest of the city is in fact a matter of a larger scale of urban planning. If we began to imagine which solutions could be brought we quickly realized that a broad diagnosis of the entire urban area was necessary, and so we had a better vision of what could be done for that territory. Many maps were used and created to illustrate this diagnosis and it allowed us to analyse difficulties we would have skipped without them. We thought those new tools would be useful for future prospective studies.

At the end of this workshop, we could mention a certain lack of elements such as a provisional budget for each of our proposals, which would be helpful to assess its technical feasibility. Even if we did work on the current context some projects and data will have an impact on our territory too: future rehabilitation work on the Loches line, the realization of the planned economic zone in the railway triangle or the new home-work way survey.

Annexes

Annexe 1 – Urban bus network



Annexe 2 – Regional bus network



Annexe 3 – Train TER SNCF

